General Catalog 1981'83, Iowa State University Bulletin

Iowa State University
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<td>Registration</td>
<td>Aug 24</td>
<td>Jan 11</td>
<td>June 1</td>
<td>Aug 23</td>
<td>Jan 17</td>
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<td>Classes begin, 7 a.m</td>
<td>Aug 26</td>
<td>Jan 13</td>
<td>June 2</td>
<td>Aug 25</td>
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<td>Holiday, office closed</td>
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<td>Classes recessed, 10 a.m.</td>
<td>Nov 24</td>
<td>March 12</td>
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<td>Holiday, offices closed</td>
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<td>Classes resume</td>
<td>Nov 30</td>
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<td>Velsha, classes dismissed noon Thurs</td>
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<td>May 5-7</td>
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<td>Graduation</td>
<td>Dec 19</td>
<td>May 15</td>
<td>July 24</td>
<td>Dec 18</td>
<td>May 21</td>
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<tr>
<td>Holidays, offices closed</td>
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The University

Iowa State University was one of the earliest institutions established in the movement to create an educational system uniquely suited to American democratic philosophy. It was chartered by the Iowa General Assembly in 1858. Four years later the national "people's college" movement was underway by the Morrill Land-Grant Act. The act made federal lands available for sale to endow colleges whose aim was to promote "liberal and practical education in the several pursuits and professions of life."

Originally these colleges were primarily concerned with subjects relating to agricultural and industrial pursuits. Thus this institution was chartered as the "Iowa Agricultural College," and in 1896 was given the more inclusive name, "Iowa State College of Agriculture and Mechanic Arts." In those beginning years it established a national — and in many cases international — reputation in the areas of agriculture, veterinary medicine, home economics, and engineering.

Adapting land-grant philosophy to the changing needs of the twentieth century, Iowa State has maintained its preeminence in these areas, but has broadened and strengthened its work in other areas to the point that its largest enrollment now is in the sciences and humanities.

Increasing numbers of students find in the broad-based curriculum of Iowa State opportunities to specialize in excellent programs of science and technology, and to acquire a broad general background of education in the liberal arts tradition.

This Iowa State University Bulletin is a general catalog of information regarding fees, curricula, and related policies and procedures. Every effort has been made to make the bulletin accurate as of the date of publication; however, all policies, procedures, fees, and charges are subject to change at any time by appropriate action of the faculty, the university administration, or the State Board of Regents.

The Development of the University

Iowa was the first state to accept the terms of the Morrill Land-Grant Act. In March, 1863, the General Assembly awarded Iowa's grant to the recently chartered institution at Ames. The school opened its doors to a preparatory class in the fall of 1868. Instruction at the college level began the following March. A class of 26 was graduated at the first commencement in 1872.

In the 1979-80 academic year more than 4,500 baccalaureate, advanced, and Doctor of Veterinary Medicine degrees were awarded.

Iowa State pioneered in the establishment of agricultural curricula, was the first state institution to found a veterinary school, and helped move engineering from a small and narrow profession to its present key position in our industrialized society. The basic sciences were emphasized. Coeducational from its beginning, Iowa State took leadership in domestic economy (later to become home economics).

Graduate study was offered almost as soon as classes began, and the first graduate degree was conferred in 1877. Experimentation and research also started early, first in agriculture and shortly thereafter in home economics, engineering, science, and veterinary medicine.

Iowa State shared the conviction with other land-grant institutions that all people should have access to the ideas and knowledge of the campus. By 1870 it was holding educational institutes in various towns—then 1903 Iowa State set the pattern of county cooperative extension as it is conducted now throughout the United States.

Iowa State's program became that of a university with special teaching responsibility in science and technology, an extension education program throughout the state, and extensive research interests to advance the frontiers of learning.

Since 1959 it has been known as Iowa State University of Science and Technology. Its continuing development in recent years has included the establishment of the College of Agriculture, the College of Design, and the School of Business Administration.

Accreditation, Sessions, and Enrollment

Iowa State University is accredited by the North Central Association of Colleges and Secondary Schools as well as by appropriate professional organizations, and is a member of the Association of American Universities.

Instruction is offered throughout the year. Prior to 1981, the University's academic year was divided into three quarters. Effective as of fall 1981, the academic year is divided into two semesters of sixteen weeks each, beginning in late August and ending in mid-May.

In 1980, Iowa State had an enrollment of more than 23,500 and a faculty of nearly 2,000.

Nondiscrimination and Affirmative Action Policy

Iowa State University reaffirms its commitment to comply with all applicable federal and state civil rights laws, regulations, and orders.

In keeping with this commitment, the University will ensure that all decisions pertinent to employment, conditions of employment, programs, activities, services and the use of facilities shall be rendered, with few exceptions, without regard to age, color, known handicaps (mental or physical), national origin, race, religion, sex, or status as a disabled veteran or veteran of the Vietnam era. Exceptions to this policy may be made in matters regarding bona fide occupational qualifications, business necessity, and to eliminate problems attendant to underutilization. Race, sex, or other such factors, when used for the purpose of reducing underutilization, must be only one of several factors considered in the selection of otherwise qualified personnel.

Further, the University will regard any act of sexual harassment which contains a threat or insinuation that the lack of sexual submission will adversely affect a person's employment, conditions of employment, academic standing, receipt of services, or other conditions which affect his or her livelihood as a violation of university policies subject to appropriate disciplinary action.

This policy applies to all university-sponsored programs and activities as well as those which are planned or conducted under the University's auspices.

Any person who believes that he or she has been the recipient of a discriminatory act prohibited by this policy may file a grievance with the University's Affirmative Action Office at 214 Beardshear. Retaliation against persons filing complaints for the redress of a grievance, or for assisting in an investigation pursuant to the filing of a complaint, shall be prohibited.
The laws of the United States and of the State of Iowa provide for resident academic instruction, research, and extension education, and for the management of Iowa State University of Science and Technology. The University and two other state educational institutions of higher learning are governed by the State Board of Regents, composed of nine members nominated by the Governor of Iowa and confirmed by the Senate of Iowa. The immediate regulation and direction of the academic, research, and extension activities of the University are delegated by the Board of Regents to the president and faculty of the University. The Board appoints an executive secretary with over-all responsibility for the administration of the central office of the Board located in Des Moines.

Officers of Administration
William Robert Parks, Ph.D., President of the University
James H. Hilton, D.Sc., President Emeritus
George C. Christensen, D.V.M., Ph.D., Vice President for Academic Affairs
Carl Hamilton, B.S., Vice President for Information and Development
Wayne R. Moore, B.S., Vice President for Business and Finance
Thomas B. Thielen, Ph.D., Vice President for Student Affairs
Daniel J. Zaffarano, Ph.D., Vice President for Research; Dean of the Graduate College
Lee R. Kolmer, Ph.D., Dean of the College of Agriculture
Michael P. Brooks, Ph.D., Dean of the College of Design
Virgil S. Lagomarcino, Ph.D., Dean of the College of Education
David R. Boylan, Ph.D., Dean of the College of Engineering
Ruth E. Deacon, Ph.D., Dean of the College of Home Economics
Wallace A. Russell, Ph.D., Dean of the College of Sciences and Humanities
Phillip T. Pearson, D.V.M., Ph.D., Dean of the College of Veterinary Medicine
Robert S. Hansen, Ph.D., Director of the Ames Laboratory, U.S. Department of Energy
Charles E. Donhowe, M.S., Dean of University Extension
Fred C. Schlunz, M.S., Dean of Admissions and Records
Jon C. Dalton, Ed.D., Dean of Student Life
Warren B. Kuhn, M.L.S., Dean of Library Services
Warren R. Madden, M.B.A., Associate Vice President for Business and Finance and Treasurer
Bernard O. Randol, B.B.A., C.P.A., Controller and Secretary

State Board of Regents
Mrs. H. Rand Petersen, President
R. Wayne Richey, Executive Secretary

Terms expire June 30, 1981
Ray V. Bailey .................................................. Clarion
Mrs. H. Rand Petersen .................................. Harlan
Donald H. Shaw ........................................ Davenport

Terms expire June 30, 1983
Percy G. Harris, M.D. ............................. Cedar Rapids
Peter J. Wenstrand ................................ Essex

Terms expire June 30, 1985
S. J. Brownlee ........................................ Emmetsburg
Ann Jorgensen ........................................ Garrison
Arthur Neu ..................................................
Admissions and Records

Fred C. Schlunz, M.S., Dean of Admissions and Records
Arthur M. Gowan, Ph D., Emeritus Dean of Admissions and Records
A. Weldon Walsh, M.S., Assistant to the Dean
Carolyn J. Harryman, B.S., Information Analyst

Records
Registrar: John V. Sjoblom, M.A.
Associate Registrars: W. Dean Nelson, M.A.; Herman L. Richtsmeier, M.S
Assistant Registrar: Kathleen M. Jones, M.S
Records Systems Analyst: Joanne A. Clark, B.S

Admissions
Director: Karsten Smedal, M.S
Associate Directors: Maurice L. Geist, M.A.; William R. Yungclas, M.S
Assistant Directors: Elve Everage, M.S., Vern E. Hawkins, M.S., Patricia J. Parker, B.A.
Admissions Counselors: Lois A. Heuer, M.S.; Lynn S. Olsen, M.S.

Iowa State University is committed to the concept and practice of affirmative action and does not discriminate on the bases of age, color, handicap (mental or physical), national origin, race, religion, sex, or status as a disabled veteran or veteran of the Vietnam era.

Admission

When to Apply
Applicants are encouraged to apply for admission well in advance of their desired entry date. High school seniors or graduates and students transferring from other colleges or universities who seek admission for the fall semester should apply during the fall of the year preceding their entry at Iowa State. Applications for other terms should be submitted 6 to 9 months in advance of the desired entry date.

Completed applications for admission to the professional curriculum in the College of Veterinary Medicine, together with the required supporting transcripts, must be received by an established deadline. See The College of Veterinary Medicine, Applications for further information.

How to Apply
Applications for admission may be obtained by writing to the Office of Admissions, 7 Beardshear Hall, Iowa State University, Ames, Iowa 50011. Applicants should describe their educational backgrounds and indicate the areas in which they plan to study. A booklet containing the application form and detailed information concerning admission will then be sent by the Admissions Office.

Approximately 2 to 3 weeks after receipt of complete application materials, including transcripts of course work completed as of the time of application, students will be notified concerning the action taken on their applications. Admission commitments are issued for a specific semester and may only be used for the term specified.

The Admissions Office, 7 Beardshear Hall, is open Monday through Friday from 8 a.m. until 5 p.m., and on most Saturday mornings from 9 until 12. Prospective students are encouraged to visit the campus and the Admissions Office to discuss any questions they may have, but personal visits are not required to gain acceptance, in most instances admission can be completed by mail.

Persons with questions concerning admission to the University may call the Admissions Office at 515-294-5836, or toll free at 800-262-3810 (from within Iowa) or 800-247-3965 (from all other states except Alaska and Hawaii).

Admission of New Undergraduate Students

Admission of Students Directly from High School
Applicants must submit a formal application for admission, together with a $10 application fee, and have their secondary school provide an official transcript of their academic record, including credits and grades, rank in class, and certification of graduation.

Applicants must also submit scores from the American College Test (ACT) or the Scholastic Aptitude Test (SAT). The Test of English as a Foreign Language (TOEFL) is required of foreign students whose first language is not English.

Applicants may be required to submit additional information or data to support their applications.

a. Graduates of approved Iowa high schools who rank in the upper one-half of their graduating classes will be admitted. Applicants who are not in the upper one-half of their graduating classes may, after a review of their academic and test records, and at the discretion of the admissions officers: (1) be admitted unconditionally, (2) be admitted conditionally, (3) be required to enroll for a tryout period during a preceding summer session, or (4) be denied admission.

b. Nonresidents of Iowa may be held to higher academic standards, but must meet at least the same requirements as resident applicants. The options for conditional admission or summer tryout enrollment may not necessarily be offered to these students.

c. Applicants who are graduates of nonapproved high schools will be considered for admission in a manner similar to applicants from approved high schools, but additional emphasis will be given to scores obtained on standardized examinations.

d. Applicants who are not high school graduates, but whose classes have graduated, may be considered for admission. They will be required to submit all academic data to the extent that it exists and achieve scores on standardized examinations which will demonstrate that they are adequately prepared for academic study.

e. Students with superior academic records may be admitted, on an individual basis, for part-time university study while enrolled in high school or during the summers prior to high school graduation.

f. In rare situations, exceptional students may be admitted as full-time students before completing high school. Early admission is provided to serve persons whose academic achievement and personal and intellectual maturity clearly suggest readiness for collegiate level study.

Recommended High School Preparation

Graduation from an approved high school shall ordinarily precede entrance into the University. Students should have completed a program of studies designed to ensure a well-rounded background of knowledge in basic fields; achieved effective study skills and work habits; developed proficiency in reading, writing, and speaking English; and acquired proficiency in basic mathematics.

Each college has recommendations regarding high school background. Students who have not had the recommended background may be inadequately prepared for programs in that college.
College of Agriculture. Recommended minimum preparation for the College of Agriculture should include 3 years of English/speech with emphasis in composition and communication skills, mathematics through intermediate algebra, and a strong emphasis in biology and the physical sciences (especially chemistry).

College of Design. High school preparation for students entering the College of Design should include 4 years of English (composition and rhetoric), 1½ years of algebra, and 2 years of science (biology, chemistry, or physics). Social sciences, including a year of world history, and a background in art and drafting, are also extremely helpful and highly recommended. Students planning to major in architecture should have high school credit in English, mathematics, including algebra, and a strong emphasis in biology and chemistry. Students interested in engineering will benefit by having had 4 years of mathematics, including trigonometry, as well as a year each of physics and chemistry.

College of Education. The high school program should encompass the various areas of study (English, mathematics, sciences, social studies and humanities) which reflect a broad general background.

College of Engineering. Students who wish to complete an engineering curriculum in 4 years should have high school credit in 3½ years of mathematics, including 2 years of algebra, 1 year of geometry and ½ year of trigonometry. Students not having this mathematics background may still enroll in the College of Engineering but should expect to spend longer than 4 years to earn a degree.

In addition to the mathematics background, students interested in engineering will benefit by having had 4 years of English and 1 year each of chemistry and physics.

College of Home Economics. Students will find it beneficial to have at least 1½ years of algebra, 1 year of chemistry, 1 year of biological science, and 4 years of English in their high school program.

College of Sciences and Humanities. Academic preparation should include at least 4 years of English composition and rhetoric, 1½ years of algebra, 1 year of geometry, 2 years of science (chemistry, physics, or biology), and 2 years of a foreign language. In addition, students planning to study a science or in a science-related discipline should complete ½ year of trigonometry and an additional ½ year of algebra or analytic geometry.

College of Veterinary Medicine. Pre-veterinary students at Iowa State University enroll in either the College of Agriculture or the College of Sciences and Humanities for their preprofessional study. It is recommended that students contemplating study in Veterinary Medicine complete a full program of college-preparatory subjects in high school including 4 years of English, at least 3 years of mathematics (including trigonometry), and 1 year each of biology, chemistry, and physics. See also Veterinary Medicine, Admission Requirements.

Admission of Students by Transfer from Other Colleges. Applicants must submit a formal application for admission, together with a $10 application fee, and request that each college they have attended send an official transcript of record to the Admissions Office. If less than 1 full year of college-level study will be completed prior to entry at Iowa State, applicants should also request that an official high school transcript be sent to the Admissions Office.

The Test of English as a Foreign Language (TOEFL) is required of foreign students whose first language is not English.

a. Transfer applicants with a minimum of twelve semester hours of graded credit from regionally accredited colleges or universities who have maintained a C average (A = 4.00) for all college work previously attempted will be admitted. Higher academic standards may be required of students who are not residents of Iowa.

Applicants who have not maintained a C average or who are under academic suspension from the last college attended may, after a review of their academic and test records, and at the discretion of the admissions officers: (1) be admitted unconditionally, (2) be admitted conditionally, (3) be required to enroll for a tryout period during a preceding summer session or (4) be denied admission.

b. Admission of students with fewer than twelve semester hours of college credit will be based on high school academic and standardized test records in addition to review of the college record.

c. Transfer applicants under disciplinary suspension will not be considered for admission until information concerning the reason for the suspension has been received from the college assigning the suspension. Applicants granted admission under these circumstances will be admitted on probation.

d. Transfer applicants from colleges and universities not regionally accredited will be considered for admission on an individual basis taking into account all available academic information.

Transfer Credit Practices. Iowa State University endorses the Joint Statement on Transfer and Award of Academic Credit approved in 1978 by the American Council on Education (ACE), the American Association of Collegiate Registrars and Admissions Officers (AACRAO), and the Council on Postsecondary Accreditation (COPA). The current issue of Transfer Credit Practices of Selected Educational Institutions, published by the American Association of Collegiate Registrars and Admissions Officers (AACRAO), and publications of the Council on Postsecondary Accreditation (COPA) are examples of references used in determining transfer credit.

The acceptance and use of transfer credit is subject to limitations in accordance with the educational policies of Iowa State University.

a. Students from regionally accredited colleges and universities. Credit earned at regionally accredited colleges and universities is acceptable for transfer except that credit in courses determined by Iowa State to be of a remedial, vocational, or technical nature, or credit in courses or programs in which the institution granting the credit is not directly involved, may not be accepted, or may be accepted to a limited extent.

Transfer credit from a two-year college will not reduce the minimum number of credit hours required for a baccalaureate degree if that credit is earned after the total number of credit hours accumulated by the student at all institutions attended exceeds one-half of the number of credit hours required for that degree.

b. Students from colleges and universities which have candidate status. Credit earned at colleges and universities which have become candidates for accreditation by a regional association is acceptable for transfer in a manner similar to that from regionally accredited colleges and universities if the credit is applicable to the bachelor's degree at Iowa State.

Credit earned at the junior and senior classification from an accredited two-year college which has received approval by a regional accrediting association for change to a four-year college may be accepted by Iowa State.

c. Students from colleges and universities not regionally accredited. When students are admitted from colleges and universities not regionally accredited, they may validate portions or all of their transfer credit by satisfactory academic study in residence, or by examination.

The amount of transfer credit and the terms of the validation process will be specified at the time of admission.

In determining the acceptability of transfer credit from private colleges in Iowa which do not have regional accreditation, the Regents Committee on Educational Relations, upon request from such institutions, evaluates the nature and standards of the academic program, faculty, student records, library, and laboratories.

In determining the acceptability of transfer credit from colleges in states other than Iowa which are not regionally accredited, acceptance practices indicated in the current issue of Transfer Credit Practices of Selected Educational Institutions will be used as a guide. For institutions not listed in the publication, guidance is requested from the designated reporting institution of the appropriate state.

d. Students from foreign colleges and universities. Transfer credit from foreign educational institutions may be granted after a determination of the type of institution involved and after an evaluation of the content, level, and comparability of the study to courses and programs at Iowa State. Credit may be granted in specific courses or assigned to general areas of study. Extensive use is made of professional journals and references which describe the educational systems and programs of individual countries.
Admission of Reentering Students

Reentering students are those who have previously attended Iowa State and are returning after an absence of at least one full term, exclusive of the summer session, in the same status in which they were previously enrolled.

Undergraduate and special students planning to reenter must complete a reentry application and return it to the Admissions Office, 7 Beardshear Hall, Iowa State University, Ames, Iowa 50011. This should be done well in advance of the desired term of reentry since approval is required prior to registration.

Graduate students do not need to complete a reentry application, but should notify the Admissions Office well in advance of the opening of the term for which reentry is desired.

Reentering students should, as early as possible, contact their advisor or department to prepare a schedule request for the term in which they are returning. This will assist departmental and classification personnel in preparing the students' class schedules and registration materials.

Classification of Residents and Nonresidents for Admission and Fee Purposes

1. General. Students enrolling at one of the three state institutions shall be classified as resident or nonresident for admission, fee and tuition purposes by the registrar. The decision shall be based upon information furnished by the student and all other relevant information.

The registrar is authorized to require such written documents, affidavits, verifications, or other evidence as are deemed necessary to establish the domicile of a student, including proof of emancipation, adoption, award of custody, or appointment of guardian. The burden of establishing that a student is exempt from paying the nonresident fee is upon the student.

For purposes of resident and nonresident classifications, the word “parents” as herein used shall include legal guardians or others standing in loco parentis in all cases where lawful custody of any applicant for admission has been awarded to persons other than actual parents.

2. Residence for tuition purposes. Rules regarding residence for admission, fee and tuition payments are generally divided into two categories — those that apply to students who are under the age of 18 and those who are 18 years of age or older. The requirements in these categories are different. Domicile within the state means adoption of the state as a fixed permanent home and involves personal presence within the state. The two categories are discussed in more detail below.

3. Students who are minors. The residence of a minor shall follow that of the parents at all times, except in extremely rare cases where emancipation can be proved beyond question.

The residence of the father during his life, and after his death, the residence of the mother, is the residence of the unemancipated minor, but if the father and the mother have separate places of residence, the minor takes the residence of the parent with whom he or she lives or to whom he or she has been assigned by court order. The parents of a minor applying for admission will be considered residents of Iowa only if they have a domicile within the state at the time of the beginning of the semester, quarter or session in which the minor is first enrolled at Iowa State University or the State University of Iowa, or University of Northern Iowa, and if the parents establish such domicile for purposes other than to qualify their child for resident tuition.

A minor admitted before his or her parents have moved to Iowa may be reclassified as a resident at the beginning of the next semester or quarter in which the student is enrolled after his or her parents have a domicile in Iowa. A minor whose parents move their residence from Iowa to a location outside of Iowa shall be considered to be a nonresident at the beginning of the next semester, quarter or session in which the student is enrolled after the date of the parents' removal from the state.

A minor under legal guardianship shall not be granted resident status if the primary purpose of the guardianship is to qualify the minor for resident tuition.

A minor living with and being supported by a relative or a friend who is a resident of Iowa, but not a minor's legal guardian, may be granted resident status if he or she has lived with the relative or friend at least three years prior to high school graduation.

4. Students over 18 years of age and married students under 18 years of age. A student 18 years of age or older and a married student under 18 years of age shall be classified as a resident if (a) the student's parents were residents of the state at the time such student reached majority or was married and the student is domiciled in another state, or (b) the student after marriage or reaching majority has established a bona fide residence in the state of Iowa by residing in the state for at least 12 consecutive months immediately preceding the beginning of the semester, quarter or session.

Bona fide residence in Iowa means that the student is not in the state primarily for the purpose of study or to evade payment of the nonresident fee and tuition shall be subject to serious disciplinary action. The resident status as a bona fide resident shall be considered to have been acquired at the beginning of the next semester, quarter or session in which the student is enrolled.

5. General facts. The resident status for admission, fee and tuition purposes of a married student shall usually be determined under these rules irrespective of the classification of the spouse. Married students under 18 years of age shall be considered to have attained majority as of the date of their marriage.

Persons who are married into the state as the result of military or civil orders from the government, or the minor children of such persons, are entitled to resident status. However, if the arrival of the parents is subsequent to the time of the beginning of the semester, quarter, or session in which the minor child is first enrolled, nonresident tuition will be charged in all cases until the beginning of the next semester, quarter, or session in which the student is enrolled.

Dependents of persons whose legal residence is permanently established in Iowa, who have been classified as residents for tuition purposes may continue to be classified as residents so long as such residence is maintained, even though circumstances may require extended absence of that person from the state. It is required that persons who claim an Iowa residence while living in another state or country provide proof of the continual Iowa domicile such as evidence that (a) they have not acquired a domicile in another state, (b) they have maintained a continuous voting record in Iowa, and (c) they have filed regular Iowa income tax returns during their absence from the state.

Ownership of property in Iowa, or the payment of Iowa taxes, does not in itself establish residence.

A student from another state who has enrolled for a full program or substantially a full program in any type of educational institution will be presumed to be in Iowa primarily for educational purposes, and will be considered not to have established residence in Iowa. Continued residence in Iowa during vacation periods or occasional periods of interruption to the course of study does not of itself overcome the presumption.

All students not classified as resident students shall be classified as nonresidents for admission, fee and tuition purposes.

A student who willfully gives incorrect or misleading information to evade payment of the nonresident fees and tuition shall be subject to serious disciplinary action and must also pay the nonresident fee for each semester, quarter, or session attended.

An alien who has entered the United States on an immigration visa and who has established a bona fide residence in Iowa by living in the state for at least 12 consecutive months immediately preceding the beginning of the semester, quarter or session may be eligible for resident classification providing he or she is in the state for purposes other than to attempt to qualify for resident status as a student.

Men or women in military service (except career service members) who listed Iowa as their residence prior to entering service and who, immediately upon return, return to Iowa to establish their residence or enter college, will be classified as residents unless their parents moved from the state while the individual was still a minor.

Change of classification from nonresident to resident will not be made retroactive beyond the semester, quarter, or session in which application for resident classification is made.
6. Guidelines. The following guidelines are used in determining the residence classification of a student for tuition purposes.

a. An unmarried minor student claiming emancipation may be required to file any or all of the following:
   (1) A statement from the student describing employment and expected sources of support as a student.
   (2) A statement from the student's employer.
   (3) A statement from the student's parents verifying nonsupport and the fact that the student was not listed as a dependent on tax returns for the past year and will not be so listed in future years.
   (4) Supporting statements from persons who might be familiar with the family situation.

A student who is deemed to be emancipated will be expected to meet the same tests as an adult in determining residence classification.

b. A minor student whose parents move from Iowa after the student is enrolled remains a resident provided the student maintains continuous enrollment until reaching the age of majority. Minor students whose parents move from Iowa during their senior year of high school will be considered residents provided that they have not established residence in another state.

c. An adult student who was a former resident of Iowa may continue to be considered a resident provided absence from the state was for a period of less than 12 months and provided residence is re-established. If the absence from the state is for a period exceeding 12 months, resident status would need to be re-established in the same manner as for an initial move to the state, unless evidence can be presented showing that Iowa residence has been maintained according to the established criteria. However, a long-term former resident who returns after an absence of more than 1 year but less than 2 years is allowed to regain residency after 1 year even though a full-time student.

d. The spouse of a person who moved to Iowa for the express purpose of accepting full-time employment is considered a resident effective at the beginning of the next semester following their move to the state.

e. An unmarried adult whose parents move to Iowa and who has been a continuous student or a member of the military service since graduating from high school may become a resident at the beginning of the semester provided the student is dependent upon the parents for major financial assistance.

f. An adult who moves to Iowa may be eligible for resident classification at the next registration following 12 consecutive months in the state provided he or she is not enrolled for more than 8 credits (4 credits during the summer session) in any semester or quarter during that 12-month period.

g. A nonresident student who marries an Iowa resident may be eligible for resident classification following the first anniversary of the marriage provided the couple maintains their residence in Iowa during that period.

A nonresident student who marries or is married to a nonresident who is not a student may become eligible for resident classification 12 months after the nonstudent spouse would normally become eligible for resident classification, usually after 12 consecutive months as a nonstudent.

h. An Iowa resident who reaches majority while in the military service will retain resident classification until the conclusion of the regular service tour, assuming that he or she returns to Iowa within 1 year following discharge. Peace Corps and conscientious objector alternate service are treated similarly.

I. The spouse of a person in military service who establishes and maintains Iowa residence according to these regulations during the tour of duty of the person in military service, may also earn residence for the person in military service provided the person in military service returns to Iowa immediately following his or her tour, and provided that the person in military service has listed Iowa as his or her home of record for at least a 12-month period immediately preceding release from the service.

j. A career military service person who entered service from Iowa and who may retire to Iowa to go to college, or the minor children of a career military service person who is still on active duty, may be granted resident classification if he or she has maintained a valid Iowa residence as evidenced by Iowa address as the official address of record.

k. If a person who is engaged in a religious vocation is a native Iowan, the time of service in the church is considered the same as required military service or Peace Corps enlistment and resident classification is granted if he or she is returning to the mission field. If service has been terminated prior to returning to Iowa, the person would be a nonresident if the return to the state was more than 12 months from the termination of the services.

The minor children of an active missionary who was an Iowa resident prior to assignment to the foreign field will be granted resident classification.

I. The following facts and circumstances, although not necessarily conclusive, have probative value in support of a claim for residence classification:
   (1) Reliance upon Iowa sources for financial support.
   (2) Domicile in Iowa of family, guardian, or other relatives or persons legally responsible for the student.
   (3) Former domicile in the state and maintenance of significant connections therein while absent.
   (4) Ownership of a home in Iowa.
   (5) Admission to a licensed practicing profession in Iowa.
   (6) Acceptance of an offer of permanent employment in Iowa.

Other factors indicating an intent to make Iowa the student's domicile will be considered by the university in classifying a student.

m. The following circumstances, standing alone, do not constitute evidence of domicile to effect classification of a student as a resident under these rules.
   (1) Voting or registration for voting.
   (2) Employment in any position normally filled by a student.
   (3) The lease of living quarters.
   (4) A statement of intention to acquire a domicile in Iowa.
   (5) Continuous presence in Iowa during periods when not enrolled as a student.
   (6) Automobile registration.

7. Review Committee. The decision of the registrar on the residence of a student for admission, fee, and tuition purposes may be appealed to a review committee. The finding of the review committee may be appealed to the Board of Regents.

8. Refugee Residency Policy. A person who has been certified as a refugee by the appropriate agency of the United States and who enrolls as a student at a university governed by the Iowa State Board of Regents may be accorded immediate resident status for tuition purposes where he or she:
   (1) comes directly to Iowa from a refugee facility or port of disembarkation; or
   (2) has resided in another state for 100 days or less; and
   (3) provides satisfactory documentation that he or she has an Iowa sponsor.

Any refugee not meeting these standards will be presumed to be a nonresident for tuition purposes and thus subject to the normal duration residency requirement.

Orientation

The undergraduate colleges of the University, in cooperation with each other and the Office of Student Life, have responsibility for the implementation of orientation programs for new students and parents. The University Orientation Committee is responsible for the year-round planning of the programs and is comprised of representatives of Iowa State University's colleges, students, faculty, and staff. The Orientation Coordinator, a member of the Office of Student Life staff, works with the planning body in developing and carrying out the orientation program.

Cyclone Aides, Iowa State students who have been selected to help acquaint new students and their parents with the University, are available at all orientation programs. The Aides are a group of men and women with widely varying backgrounds and interests.

Extensive orientation opportunities are provided in the summer and fall programs. Some colleges hold special orientation sessions for transfer students during the spring. Orientation sessions are also held at the beginning of each fall, spring, and summer session for all new students entering Iowa State at these times.

(7) Other public records, e.g., birth and marriage records.
**Summer Orientation**
The summer orientation program, 26 one- to two-day sessions, is scheduled in May and June, is intended to introduce new students and parents to university life and learning. The primary concern of orientation sessions is to make academic success at the University as likely as possible for the student participants. In addition to a program emphasis on the testing and placement of students, in appropriate courses for the first semester, an effort is made to provide time for new students and parents to participate in guided tours of the University and formal and informal meetings with faculty, staff, Cyclone Aides, and other new students and parents. The purposes of such meetings are to create a comfortable, informative atmosphere, lessen existing anxieties, assist each person in the development of a clearer understanding of the challenge of the university environment, and make it possible for new students — with support from their parents — to begin to make the academic and social decisions which are faced by all students at the University.

Entering students are encouraged to attend summer orientation in order to accomplish more thoroughly orientation activities that ordinarily mark the beginning of the fall semester for new students. In college mailings sent during the spring, new students are asked to select a convenient time from among a number of orientation sessions that are scheduled during May or June. Parents are urged to accompany students whenever possible.

Housing and meals are provided for new students and parents in campus residence halls for nominal fees; or participants in summer orientation programs may choose to stay at hotels and motels in Ames. Cyclone Aides live in the residence halls with the new students and are available at all times for informal discussion.

**Fall Orientation**
The fall orientation program is designed to assist new students who did not attend summer orientation in making a personal adjustment to the University and to enable them to become acquainted with the resources for intellectual and personal development at Iowa State. In conjunction with fall orientation, New Student Week activities are scheduled during the week of the opening of fall semester. All new students, including transfer students, are invited to participate in New Student Week. Activities of the week include a close look at the student’s college, a look at the extracurricular activities at Iowa State, residence orientation, and entertainment.

Cyclone Aides are available to help new students with questions and concerns during the fall orientation program.

**Medical Information**
New students will be sent a medical history form with their letter of admission. The medical form should be completed and returned to the Student Health Service before registration.

**Registration**
Registration and the payment of assessed fees are required of all who attend classes. Registration is not complete until fees are paid, including board and room fees for those living in residence halls.

Students who wish to initiate registration within the period between the 5th and 10th class day must obtain written permission from the instructors under whom they will be taking work and the approval of the dean of the college in which they will be registered. Registration for any semester will be closed after the 10th class day.

For summer session the 5th and 10th class days would be replaced by the 3rd and 5th class days.

**Classification**
Students not admitted to any class nor are those dropped from any class except by permission of their dean. Students may not classify at conflicting hours without the approval of the departments concerned. Any student may be required to drop work which is not being accomplished in a satisfactory manner.

A change from one college to another within the University requires the permission of the dean of the college to which the student wishes to transfer. A change from one curriculum to another in the same college requires the approval of the dean of the college as well as the head of the curriculum to which the student wishes to transfer.

**Transcript of Record**
Students may obtain a transcript of their academic record for a small fee by contacting the Office of the Registrar, 107 Beardshear Hall.

**Withdrawal**
Students who withdraw from the University during any term of their enrollment should report to their dean. Those who withdraw receive refunds according to university policy outlined under Fees and Expenses.

**Credit by Examination (Test-Out)**
Persons with superficial high school background or with college-level proficiency in certain areas may obtain academic credit by means of special examination. These examinations are administered by the department offering the course, and anyone interested in taking a test-out exam should check with the appropriate department. A fee is charged to take each examination. Credit is awarded only to students enrolled at Iowa State.

Successful completion of an examination for a given course will earn the student credit for that course. The credit will be recorded on the student’s permanent record and may be applied toward graduation, but no letter grade will be recorded and the performance will not affect the student’s quality-point average.

Iowa State will also grant up to 4 semester-hours credit in each of three areas of the College Level Examination Program (CLEP) — Humanities, Natural Sciences, and Social Sciences — if the student’s score meets the minimum level established by the University. This credit is not evaluated as equivalent to any particular courses, but it may be used to meet general education requirements in certain colleges.

Scores on CLEP exams taken elsewhere may be forwarded to Iowa State for evaluation for credit, or arrangements may be made to take the examinations through the ISU Student Counseling Service.

Credit established by examination at another accredited college or university may be accepted at Iowa State if it is accompanied by at least 12 hours of college credit earned in residence at the institution making the report.

Some professional programs require regular grades in all preprofessional courses. Students who anticipate applying to such programs should inquire about the acceptability of credit by examination before attempting to test out of preprofessional courses.

**Credit for Military Service**
1. Credit may be allowed in military science for service in a branch of the armed forces to the extent that such service approximates the courses in military science offered at Iowa State. Inquiry should be made to the appropriate military department regarding the procedure for securing credit. This will usually be done by a test-out examination and results reported to the Office of the Registrar.

2. Credit will be allowed for college courses completed through the United States Armed Forces Institute (USAFI) by correspondence study and the Defense Activity for Non-Traditional Education Support (DANTES), subject to the usual rules involving credits of this nature.

3. Credit will be awarded for successful completion of technical or specialized schools attended while on active duty with the armed forces to the extent that the material is applicable toward degree requirements at Iowa State. Application for such credit is made at the Office of Admissions. The Admissions Office is guided by the recommendations in the American Council on Education publication, *A Guide to the Evaluation of Educational Experiences in the Armed Services.*

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**Regents Universities Student Exchange Program**
Iowa State students may take courses at either of the other two Regents universities for Iowa State resident credit. Regular, degree-bound students in good standing at any of the three Regents universities may attend another Regents university for a maximum of 2 semesters, and the credits earned at the other university will be counted as resident credit at the home institution. Approval for participation and credit in the exchange program must be obtained well in advance of registration since the department head must approve the acceptance of such credits if these are to apply to the major, and to insure complete processing of the application between the cooperating universities within specified dates for enrollment. Detailed information and application forms for the exchange program are available from the Office of the Registrar.
Fees and Expenses
(Fees and tuition are subject to change without notice.)

A registration fee is charged all students of the University. A full registration fee covers most laboratory fees, access to student health facilities, use of the Library, membership in the Memorial Union, and a number of student activities. In certain courses involving special expenses, an additional fee may be charged. These fees are indicated in the course description of the specific courses involved.

Students who are not residents of Iowa pay an additional tuition fee each semester. This tuition fee is assessed as one credit only if no other credits are effective as of fall semester 1981. They are

All registration fees are charged all students of the University. A full registration fee is assessed to those who do not complete registration during the regular registration period. Maximum charge for late registration is $10.

Reinstatement Fee
Students receiving college approval to be reinstated after having been dropped for nonpayment of fees must pay a $10 reinstatement fee in addition to all other fees due.

Fee Schedule
Per Semester
Resident Nonresident
Undergraduate
(12 or more hours) .74 475 . $1175
Graduate
(9 or more hours) 540 .1243
Veterinary Medicine
(12 or more hours) 1000 . . 2050

Fees for students enrolled for less than a full course load are given below. There is a minimum 2-hour fee for all students. Audits and zero credit courses are assessed on contact hours and there is a maximum charge for zero credit courses of 3 hours. R credits are assessed as one credit only if no other credits are taken. The continuing registration fee for graduate students is $80. If the total number of credits includes .5 credit, such as 6.5, fees are assessed as the next larger whole number of credits. Therefore 6.5 credit hours would be assessed as 7 credit hours.

Summersession fees are charged per credit hour as indicated in the hourly fee schedule, except that nonresidence students taking 2 hours or less are assessed at the resident rate.

Hourly Fee Schedule
Undergraduate Graduate Vet. Med.
1 $80 80* $120 120* $168 168* 2
2 80 80* 120 120* 168 168* 3
3 120 120* 180 180* 252 252* 4
4 160 160* 240 240* 356 360 4
5 200 200* 300 300* 420 450 5
6 240 240* 360 360* 504 540 6
7 280 280* 420 420* 588 600 7
8 320 320* 480 480* 672 672 8
9 360 360 540 540 756 756 9
10 400 400 600 600 840 840 10
11 440 440 660 660 924 924 11
12 or more 475 475 750 750 1000 1000

*Nonresident students taking 4 hours or less fall and spring and 2 hours or less summer are assessed at the resident rate.

Private Music Instruction
University students, per semester
1 lesson per week, ½ hour $50
1 lesson per week, 1 hour $80
Nonuniversity students, per semester
1 lesson per week, ½ hour $90
1 lesson per week, 1 hour $160

Special Students and Noncollegiate Students
Special students and noncollegiate students pay the same fees as undergraduates.

Application Fee
A fee of $10 must accompany the application for admission and is nonrefundable except in the case of residents of Iowa who are denied admission. This fee will not apply to special students or workshop applicants.

Late Registration Fee
A fee of $5 for the first day and $1 per day thereafter is charged to those who do not complete registration during the regular registration period. Maximum charge for late registration is $10.

Reinstatement Fee
Students receiving college approval to be reinstated after having been dropped for nonpayment of fees must pay a $10 reinstatement fee in addition to all other fees due.

Activity Fee
The activity fee for undergraduates and graduate students taking courses on campus is included in the general registration fee. Fees for courses taken off campus do not include the activity fee. Off-campus students may pay $25 per semester which allows them to pay student admission rates to concerts, lectures, debates, and athletic events.

Senior Fee
A $2 fee covers the cost of special senior activities.

Fee Refund for Cancellation of Registration
For those who withdraw during the first week, a 100 percent refund will be made. For those who withdraw after the first week, $50 will be retained and the remainder refunded according to the following schedule:
75 percent if withdrawal is during the second week.
50 percent if withdrawal is during the third week.
25 percent if withdrawal is during the fourth week.

No refund for a withdrawal after the end of the fourth week.

Fee refund for students who drop into light classification or reduce overload:
90 percent if change is made during first week.
75 percent if change is made during second week.
50 percent if change is made during third week.
25 percent if change is made during the fourth week.

No refund after the fourth week.

For the refund policy for off campus courses, contact the Office of Continuing Education.

Change of Classification Fee
Starting the 6th day of classes a $5 fee is charged for course drops, additions, and section changes. Changes approved by the classification office at the same time are charged a single fee.

Workshops on Campus
Graduate and undergraduate students enrolled in 1-credit workshops on campus pay $50 tuition.

Off Campus Fees
For off-campus fees, contact the Office of Continuing Education.

All-University Scholarships
A Family Financial Statement will give a student consideration for the following scholarships:

C. G. Adams Scholarship for a member of Delta Upsilon social fraternity. No application necessary.
Alumni Achievement Fund Scholarship for freshmen and undergraduates.
Athletic Grants-in-Aid for graduating high school seniors. Established by the Big Eight Conference universities. Apply to Department of Athletics.
George Washington Carver Scholarship for students enrolled in journalism and mass communication.
Lowell L. Carver Industrial Education Scholarship for undergraduates majoring in industrial education with at least a 2.00 grade-point average.
George W. Catt Memorial Scholarship for seniors and some juniors. No application necessary.

Class Scholarships for freshmen and undergraduates. Established by the classes of 1911, 1915, and 1917.
Delta Delta Delta Scholarship for an undergraduate woman. Apply to Delta Delta Delta Sorority, 302 Ash Avenue, after arrival at Iowa State University.
Epsilon Chapter of Tau Kappa Epsilon Fraternity Scholarship for a member of that fraternity. No application necessary.

General University Scholarship for freshmen and undergraduates.
Dean Heter Class of 1855 Scholarship for sophomores and juniors.

Scholarship Council Scholarship for a freshman. Apply to Interfraternity Council after arrival at Iowa State University.

Iowa Southern Utilities Scholarship for students whose parents are customers of Iowa Southern Utilities. Apply to Financial Aid and Student Employment Office, 12 Beardshar Hall.

Iowa State Club of Chicago Scholarship for a student who will graduate from a high school in the West Suburban and Suburban League of Chicago. Apply to high school principal of respective schools.

Lena-Wells Scholarship for seniors and some juniors. No application necessary.

Laveme Noyes Scholarship for freshmen and undergraduates who are blood descendants of men who served in World War I. Apply first semester to Financial Aid and Student Employment Office, 12 Beardshar Hall.

G. W. Morrison Scholarship for students with a financial need who have shown qualities of leadership, ability, and future credit to ISU.
Schlelter Scholarship is based on scholarship and leadership. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.

Agricultural Scholarships

Applicants must submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.

C. H. Chase Honorary Scholarship is based on scholarship and leadership. Applicants must submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.

Iowa Crop Improvement Association Scholarship is based on scholarship and leadership. Applicants must submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.

Iowa Golf Course Superintendent's Scholarship is based on scholarship and leadership. Applicants must submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.

Iowa Hoo Hoo Club Award is based on scholarship and leadership. Applicants must submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.

Iowa Master Farmer's Club — Wallace Farmer Scholarship is based on scholarship and leadership. Applicants must submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1. Applicants should submit their applications before the deadline. Applications are due to the Scholarship Committee by March 1.
Reliant Purina Company Scholarship for a junior or senior in agricultural business, agricultural education, agricultural engineering, agricultural journalism, agricultural mechanization, agronomy, animal science, dairy science, farm operation, or food technology.

Rice Estate Advanced Curriculum Scholarship for juniors and seniors.

Rice Estate International Agriculture Scholarship for juniors or seniors majoring in international agriculture.

Rural Electric Cooperative Pioneers Scholarship for agricultural journalism undergraduates.

Bruce Russell Scholarship for a junior in agricultural business, agricultural education, agronomy, animal science, dairy science, farm operation or food technology.

Oiga M. Skott and Orville Ruggeberg Memorial Award for an undergraduate student in dairy science.

Mogens Charles Strom Award for a junior, or senior student in dairy science, sponsored by undergraduate students.

Soil Conservation Society of America Scholarship for juniors and seniors interested in conservation careers.

Bruce M. Stewart Memorial Scholarship for a sophomore, junior, or senior student in agricultural business, agricultural education, agronomy, animal science, dairy science, farm operation or food technology.

Charles Strom Award for a junior student in forestry. No application necessary.

Margaret S. Thompson Marketing Scholarship for an undergraduate student planning a career in marketing.

Mogens Toflstrup for a sophomore with selection based on scholarship.

Wheelock Wilson Horticulture Scholarship for a junior or senior in horticulture.

H. K. Wilson Advanced Curriculum Scholarship for a sophomore who has earned a 3.00 cumulative average.

Wilson Foods Corporation Meat Science for an upperclass student interested in meat science and related areas.

WMFT Chuck Wrocestor Broadcasting Scholarship for a student in agricultural journalism or agriculture interested in farm broadcasting.

Zimmerman Memorial Prize for a junior in horticulture. No application necessary.

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Design Scholarships

Students enrolled in the College of Design should contact their departmental office for further information about scholarships and awards.

AIA Scholarship Award for students in architecture.

Janice Peterson Anderson Award for recognition of distinguished artistic performance by students in the Department of Art and Design. Art work retained one year for exhibition.

Thomas A. Barton Scholarship for a junior or senior in landscape architecture.

Charles F. Bowers Award for a senior student in undergraduate architecture program with the best overall grade point record.

AIA/IAIA Chapter Construction Specifications Institute Award for junior, senior, or graduate students enrolled in architecture who are from the geographical area of CSI/IAIA Chapter.

Lee Daly Award for a student in architecture on the basis of highest cumulative average upon completion of the fourth year as a tuition grant to be awarded upon acceptance into ISU Graduate College.

Julie Diekmann Scholarship for a senior woman in art and design.

Federated Garden Clubs of Iowa, Inc. Scholarship for an undergraduate student in landscape architecture.

Burdeitt Higginson Awards Scholarship for a graduating senior in architecture.

Karl Ketter Memorial Scholarship for an architecture student.

Kimball Award for architecture students.

Ralph Rothacker Memorial Scholarship for a junior or senior landscape architecture student.

Ada Swallwell Scholarship for a senior landscape architecture student.

Clair B. Watson Scholarship for an undergraduate major in the College of Design.

Leonard Wolf Memorial Scholarship for a junior or senior in architecture.

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Education Scholarships

W. Price and Lucille Morris Scholarship for new freshmen entering the College of Education. Apply to the College of Education by May 1 of high school senior year.

Barton Morgan Scholarship for undergraduates enrolled in the College of Education.

Elaine M. Markley Scholarship for undergraduate junior and senior students enrolled in elementary education.

Education Council Scholarship for entering freshmen and senior students enrolled in the departments of elementary education, industrial education, and physical education and leisure studies.

Ray J. Bryan Scholarship for a senior student in teacher education planning to pursue graduate work in guidance and counseling.

Lowell L. Carver Industrial Education Scholarship for undergraduates in industrial education with a 2.00 grade point average.

Bob Carpen Memorial Scholarship for a black student from Des Moines majoring in industrial education.

Germaine M. Giulet Scholarship for a junior student majoring in physical education.

Helen LeBaron Hilton Graduate Student Awards for master's degree students in physical education. Two awards given annually, one for excellence in completed research and one for outstanding teaching.

Winifred Tilden High School Awards in the Department of Physical Education for freshmen, sophomore, junior, senior, and graduate students.

Harry Schmidt Outstanding Senior Award for a senior woman in the Physical Education Curriculum.

Chele Gosler Memorial Award for a sophomore woman in the Physical Education Curriculum.

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American Institute of Industrial Engineers for a senior in industrial engineering.

Robert D. Albertson Memorial Award for a freshman in engineering.

Alcoa Engineering Achievement Scholarship for an engineering senior.

Alcoa Engineering Scholarships for undergraduates in industrial engineering, metallurgical engineering, ceramic engineering, electrical engineering, and mechanical engineering.

W. B. Boas Scholarship for a junior or senior in electrical engineering.

Boeing Company for undergraduates in aerospace, computer science and civil engineering.

Boons for a junior or senior in electrical, industrial or mechanical engineering.

Amos E. Butsell for a senior in mechanical or electrical engineering.

Cargill for seniors in agricultural, mechanical and chemical engineering.

Catt & Lane Wells for seniors in engineering.

Pramo Chiodi Metallurgy Scholarship for all (including graduate) in metallurgical engineering and metalurgical science.

Ceramic Engineering Alumni Fund Scholarship for students in ceramic engineering.

Continental Oil Company for students in chemical engineering.

Electric Cooperative Pioneers Trust for senior in electrical engineering.

Ferro Corporation for junior or senior in ceramic engineering.

Almon H. Fuller for senior in civil engineering.

Murray Geuthert Scholarship in Ceramic Engineering for undergraduates in ceramic engineering.

Jessie Davidson Gaylord Memorial for an undergraduate.

Sidney W. Gaylord Memorial for a junior and senior in civil or construction engineering.

Gibbs-Cook for a junior and senior in civil or construction engineering.

A. P. Green Refractories for an undergraduate in ceramic engineering.

Water N. Hardly Memorial Scholarship for senior in civil engineering.

Hennings H. Henningson Memorial for a freshman in electrical engineering.

Honeywell Electrical Engineering Scholarships for undergraduates in electrical engineering.

Cedar Rapids Section of IEEE for junior or senior in electrical engineering.

Ingersoll-Rand for seniors in mechanical engineering.

Donald D. Kaser Memorial for an undergraduate in engineering.

Frank Kareklos Memorial for a junior or senior in civil engineering.
Kimball Memorial Scholarship for a junior or senior in mechanical engineering.
Kodak Employee/Alumni Grant for undergraduates.
Walter T. Lawrence Memorial for a sophomore, junior or senior in electrical engineering.
Meytag Scholarship in Engineering for seniors in mechanical and industrial engineering.
Frank McCutcheon for a junior in metallurgical engineering.
James P. McLean Memorial Scholarship for a sophomore in industrial engineering.
Mechanical Contractors of Iowa for undergraduates in construction or civil engineering.
Merritt-Schultz & Associate Engineering for junior or senior in civil or construction engineering.
Kenneth G. Meyerhoff Trust for freshman in engineering.
Minnesota Mining & Manufacturing Company for seniors in chemical, mechanical, industrial or electrical engineering.
Monsanto Tau Beta Pi Membership Award for seniors in chemical, mechanical, and electrical engineering.
Nelson Brothers Scholarship for a student in engineering.
Phillips Petroleum for undergraduate in chemical engineering.
Refactories Education for undergraduates in ceramic engineering.
Frank H. Ricker Memorial for junior or senior in engineering.
Harris F. Seldel Scholarship for junior or senior in civil engineering.
Adolph Shave for junior or senior in electrical engineering.
Society of Manufacturing Engineers for undergraduates in mechanical or industrial engineering.
Sunstrand Corporation for freshman, sophomore, or junior in mechanical, electrical, aerospace and engineering science & mechanics.
Tektronia for junior and senior in material science and chemical engineering.
Russell Thompson Memorial Scholarship for sophomore in agricultural, civil, electrical or mechanical engineering.
H. O. Ustrud Memorial for junior or senior in civil engineering.
American Society for Metals for undergraduate in metallurgy engineering.
Stan Anderson Scholarship Fund for junior or senior in mechanical engineering.
Associated General Contractors for undergraduates in civil or construction engineering.
Bohnski Scholarship for undergraduates in construction engineering.
Henry M. Black Scholarship for junior or senior in mechanical engineering.
Black-Veatch Consulting Engineers for undergraduates in civil engineering, mechanical engineering, electrical engineering.
Celebese Scholarships for undergraduates in chemical and chemical engineering.
F. C. Clutterbaugh Company for undergraduates in electrical engineering.
Consulting Engineers Council of Iowa Scholarship for junior or senior in mechanical, civil or electrical engineering.
J. B. Davidson Memorial for undergraduates in agricultural engineering.
Dow Chemical for undergraduates in chemical engineering.
FMC Corporation for juniors in mechanical engineering.
Green Construction Company for undergraduates in construction engineering.
John Hart Engineering Award for undergraduates in construction engineering.
Hempstead-Walkup Scholarship for junior or senior in industrial engineering.
Hoak Construction Company for freshman in engineering.
Iowa County Engineers Civil Engineering Award for full time undergraduates in civil engineering.
Klinger Senior Award for senior in construction engineering.
Master Builders of Iowa for undergraduates in construction engineering.
Merritt Shop Foundation for undergraduates in construction engineering.
Missouri Valley Machinery Company for undergraduates in engineering.
Guy W. Morrison Memorial for junior or senior in mechanical, electrical, civil, industrial, or technical journalism.
Pioneer Lumber Company for junior or senior in civil engineering.
Ben W. Scheeler Memorial Fund for junior or senior in mechanical engineering.
Sheffield Brick & Tile Company for undergraduates in engineering.
Sheet Metal Contractors of Iowa for undergraduate in construction engineering.
Shell for undergraduates in mechanical or chemical engineering.
Square D. Engineering Scholarship for freshman in engineering.
Union Carbide Corporation for undergraduate in mechanical engineering.
H. O. Ustrud Senior Award for senior in civil engineering.
Home Economics Scholarships.
To apply for scholarships and awards given by the College of Home Economics, a student must (a) complete and submit an application form by April 1 for incoming freshmen and by March 1 for sophomores, juniors, and seniors, and (b) submit a Family Financial Statement (FFS) or Financial Aid Form (FAF) by February 1. Application forms are available in the Office of the Dean of the College of Home Economics, 122 MacKay Hall. For scholarships given by departments, send your inquiry to the respective department office as indicated below.
Marietta Barnie Anderson Scholarship Fund for a sophomore student in home economics education.
Grace M. Augustine Scholarship for a graduate student in institutional management. Inquire at Institution Management Department, 11 MacKay Hall.
Howard Johnson Company Restaurant Management Award for an undergraduate preparing for a career in restaurant management. Inquire at Department of Institution Management, 11 MacKay Hall.
Bishop Buffeta, Inc. Scholarship for students in 4-year institution management degree programs. Inquire at Institution Management Department, 11 MacKay Hall.
Lillian Storms Cooper Memorial Scholarship for a graduate student in nutrition or dietetics. Inquire at Food and Nutrition Department, 107 MacKay Hall.
Fanchn H. Crawford Scholarship for a person who intends to work in school food service or is now engaged in school food service work and wishes to prepare further for responsibilities of school food service administration. Inquire at Institution Management Department, 11 MacKay Hall.
Ruth De Vaul Recognition Award for a graduate student in nutrition. Established by the Food and Nutrition Department.
Donelson Scholarship for a student in home economics. Established by Dr. and Mrs. James H. Garmer, Jr. Inquire at Department of Institution Management, 11 MacKay Hall.
Anna Lee Garrett Gauthsch Scholarship for an undergraduate student in home economics who has demonstrated high scholarship and proficiency in the natural and physical sciences. No application.
Norma R. Holen Scholarship for a student in textiles and clothing having junior or senior classification. Inquire at Textiles and Clothing Department, 140 LeBaron Hall.
ISU Home Economics Alumni Association Scholarship Fund for a student in home economics. Established by the ISU Home Economics Alumni Association.
Louise Kelsey Memorial Award for a student in home economics education.
Belle Lowe Recognition Award for a senior in food science. Established by a bequest in the will of Anna M. Osen. No application.
Catherine MacKay Scholarship for freshmen, sophomores, juniors, and seniors in home economics.
Martha Moffit Scholarship for undergraduate students in food and nutrition in dietics. Inquire at Food and Nutrition Department, 107 MacKay Hall.
P. Mabel Nelson Scholarship for undergraduate students in home economics. Inquired at Food and Nutrition Department, 107 MacKay Hall.
W. P. Zabel Scholarship for undergraduate students in home economics. Inquire at Food and Nutrition Department, 107 MacKay Hall.
Ester Compton Ogland Memorial Scholarship for a student resident who is a senior in home economics education.
Raymond A. Pearson Memorial Scholarship for a sophomore, junior, or senior student in home economics.
Florence Pen Scholarship for graduate students in food and nutrition. Inquire at Food and Nutrition Department, 107 MacKay Hall.
Saga Food Service Scholarship for students in institution management. Inquire at Department of Institution Management, 11 MacKay Hall.
Deborah P.N.Y. Sodt Memorial Award for a student majoring in child development.
Vetechs Cherry Pie Award for an undergraduate or graduate student in institution management. Established by Institution Management Club and Institution Management Department. Inquire at Institution Management Department, 11 Mackay Hall.

Florence Wafls Scholarship for sophomores, juniors and seniors in home economics.

Sciences and Humanities Scholarships
Germere Herr Adamson Scholarship in mathematics for an undergraduate student who has displayed ingenuity in mathematics. No application necessary.

Alaska Accountancy Award for a junior accounting student in the School of Business Administration. No application necessary.

Alumni Achievement Fund Scholarship for an outstanding music major performer. Apply to Music Department by January 15 of high school senior year.

Arnes International Orchestra Festival Scholarship for an outstanding music major performer. Apply to Music Department by January 15 of high school senior year.

Marjorie Benzier Scholarship for an outstanding music major performer. Apply to Music Department by January 15 of high school senior year.

Carptil Accounting Scholarship for a senior accounting student in the School of Business Administration. No application necessary.

Primo Chiotti Scholarship for an undergraduate in metallurgy. Apply to Department of Materials Science and Engineering.

John Deere Accounting Award for a junior accounting student in the School of Business Administration. No application necessary.

Ernst and Ernst Accounting Scholarship for a senior accounting student in the School of Business Administration. No application necessary.

George Freeman Memorial Scholarship for a junior, senior or graduate student in general or rural sociology.

Charles A. Goetz Scholarship sponsored by the Dow Chemical Company for a freshman in chemistry. Apply to Department of Chemistry at the end of the first semester of high school senior year.

Hayward-Goodspeed Scholarship for a sophomore in the Department of Biochemistry and Biophysics. No application necessary.

Pearl Hogrefe Award for undergraduates and graduates who display unusual promise as writers. Applications accepted spring semester. Department of English.

Dio Lewis Holl Award to an outstanding senior who completes work in the current academic year in the Curriculum in mathematics.

Alfred P. Kohnebeck Memorial Scholarship for an outstanding junior or senior in foreign languages and literature. Apply to Department of Foreign Languages and Literatures.

Alva Lauer Award for the outstanding senior in applied experimental psychology. Department of Psychology. No application necessary.

James and Rachel Lowsrle Award for outstanding students in literature. Department of English. No application necessary.

Thomas H. McBride Scholarship in natural sciences to undergraduates in the Lakeside Laboratory. Apply to Director, Iowa Lakeside Laboratory, Zoology Department, University of Iowa, Iowa City.

Robert McCowan Memorial Scholarship for an undergraduate student who has contributed to musical activities. No application necessary.

McFarland Clinic Partnership Memorial Scholarship for students preparing for study of human medicine. Apply to Department of Zoology by April 1.

J. B. McSloley Accounting Award for a senior accounting student in the School of Business Administration. No application necessary.

Iza Neimack Violin Scholarship to an outstanding music major student. Apply to Music Department before January 15 of high school senior year.

Physics Department Award: undergraduates: scholarship awarded for freshman, sophomore, junior and senior students; graduate student awards: Richard G. Patrick Award for outstanding teaching; Fox Research Award No application necessary.

Purchasing Agents Scholarship for a junior or senior in the general area of purchasing. No application necessary.

Schrumpfer Scholarship Fund provides awards in varying amounts to students showing academic achievement and contributions to the School of Business Administration. The fund was established by alumni of the department and named in honor of Emeritus Professor and former department head William H. Schrumpfer.

Laurn Vernon Scholarship awarded by Sciences and Humanities Council. School of Business Administration, and participating college departments to students currently employed. Apply at beginning of spring semester to participating departments or to School of Business Administration.

Louis Simms Scholarship for outstanding junior or senior in foreign languages and literature. Apply to Department of Foreign Languages and Literatures.

Frederick V. Shattuck Scholarships for freshmen, sophomores, and juniors who display talent in and dedication to theatre. Apply to Department of Speech.

Shell Company Foundation Scholarship for a senior in the Department of Computer Science. No application necessary.

Rudy Von Drie Memorial Scholarship for a junior in the School of Business Administration who has strong interest in the free community publication business. No application necessary.

Von Tungeln Award for undergraduates and graduates in sociology. Apply to the Sociology Department.

Will C. Jumper Award to a promising undergraduate or graduate writer of fiction, poetry, or drama. Applications accepted spring semester. Department of English.

Veterinary Medicine Scholarships

Ak-Sar-Ben Award to one student who has completed the third year of veterinary medicine curriculum.

Allen Products Scholarship for students in veterinary medicine with financial need.

American Animal Hospital Association Award for a senior AAHA student affiliate member for clinical proficiency in small animal medicine and surgery.

American Veterinary Medical Association Women's Auxiliary Award for a senior veterinary student.

Bollis Scholarship in Avian Medicine for a third or fourth year student entering graduate school and pursuing avian medicine.

Diamond Laboratories Scholarship for juniors who have financial need and are in the upper third of their class.

Dubuque County Veterinary Medical Society Award is presented to a third-year student in veterinary medicine interested in practice.

Dubuque Kennel Club Scholarship for a third-year student who has an interest in small animal practice, good scholastic standing, and financial need.

Veterinary Medicine Scholarship Fund provide awards in varying amounts to students showing academic achievement and contributions to the School of Business Administration.
**Student Housing**

A deposit is required at the time an application form is completed for accommodations in the residence halls or when an application card is completed for a family apartment or single student apartment operated by the University.

Address correspondence concerning undergraduate and graduate single student housing to the Administrative Office, Department of Residence, 1215 Friley Hall, Iowa State University, Ames, Iowa 50012, or to the Director of University Student Apartments, 100 University Village, Ames, Iowa 50010, for family or single student apartments.

**Undergraduate Residence Halls**

Residence halls at Iowa State have complete facilities for comfortable living. All residence complexes have lounges, recreation rooms, and club facilities. Each house in the hall has a live-in resident assistant and each hall has a live-in hall adviser to help students in their residence hall living experiences.

Most of the rooms in residence halls are planned for double occupancy; however, approximately twenty percent are presently accommodating three persons. They are furnished with single beds, innerspring mattresses, chests of drawers, individual study desks, chairs, and a telephone. Students provide their own bed linens, mattress pads, throw rugs, blankets, pillows, towels, and study lamps (except Larch Hall where study lamps are furnished). Students are responsible for maintaining the cleanliness and order of their own rooms. A linen rental service is available.

Cafeteria-style food service is provided for all residents in the halls. Students living off-campus may purchase a residence hall meal ticket. These tickets are available at 1215 Friley Hall. A choice of dining hall is made at the time of purchase and is subject to space available.

A single student who resides in an undergraduate residence hall must sign a contract for room and board for the academic year or the remainder thereof if contract is signed after fall semester begins. All charges are subject to change. The rate for the academic year 1980-81 was $1,467.

Students may purchase their housing contracts at any time during the academic year upon payment of a fee. If a student does not plan to live in the residence halls the entire academic year, he or she should check with the housing office before signing a contract.

The residence halls are organized geographically into three autonomous student associations: The Towers Residence Association (TRA), the Richardson Court Association (RCA), and the Union Drive Association (UDA). The students in each of these coeducational associations elect a group of executive officers who are responsible for coordinating university events and activities with the association residence hall program. In addition, each association funds and maintains a social program, an intramural program, a camera club, a ham radio club, and numerous committees that supplement the total social educational development of the individual residents. The three associations also jointly sponsor several projects such as the KPGY FM radio station and Residence Hall Week.

Each association is further organized into smaller living groups called houses. These houses of 55 to 75 members are the foundation of Iowa State's residence hall program. Members of the houses elect their own officers and the majority of all programs are planned on a house participation basis. The individual's educational experience is augmented by active participation in the total house program.

Most fraternities ask pledges to live in the chapter houses part of the year. Therefore, students who plan to pledge and live in a fraternity should check housing facilities in the fraternity before signing a residence hall contract.
Graduate Residence Hall

Buchanan Hall provides housing in 174 single occupancy rooms and 106 double occupancy rooms for single graduate students and single adult undergraduate students. A suite-type room plan provides a semiprivate bath shared by the occupants of two single rooms or two double rooms. Public areas include a lounge, television room, recreation area, vending room, laundry room, and administration office.

Rooms are furnished with single beds, innerspring mattresses, chests of drawers, individual study desks, chairs, and room telephone. Bed linens are furnished and maid service is provided weekly. Students provide towels and study lamps.

The room rate as of June 1980 was $714 per academic year in a double room, or $939 per academic year in a single room. A meal ticket may be purchased (for $861 per academic year as of June 1980) to eat in a residence hall dining room.

Single Student Apartments

There are 105 two-bedroom apartments in Schilletter Village designated for use by single students. The rate for these apartments as of July 1980 was $279 per month per apartment. Each apartment normally houses 4 students.

The apartments are furnished with the same furniture used in the undergraduate residence hall rooms plus range and refrigerator. Water service and trash removal are included in the rent. Students pay their own gas, electricity and telephone.

There are also 150 one bedroom apartments in Pammel Court designated for use by single students. Pammel Court units are furnished with range, refrigerator, drapes, bunk beds and mattresses. Water service and trash removal are included in the $90.00 (July 1980) a month rental rate. Students pay their own gas, electricity and telephone. Each apartment houses two single students.

Family Apartments

The University provides 155 apartments in Schilletter Village, 500 apartments in University Village, 196 apartments in Hawthorn Court, and 370 apartments in Pammel Court for student families. Rates for these apartments as of July 1, 1980 were $174 per month for Schilletter Village, $159.50 per month for University Village, $148 per month for Hawthorn Court, and $65-$70 per month for Pammel Court. Apartments are unfurnished except for ranges and refrigerators, which are provided in all but Pammel Court. Family apartments in Pammel Court have ranges but not refrigerators. Water service and garbage removal are included in the rental. Residents pay for their own gas, electricity, and telephone.

Approximately 40% of Iowa State's student families live in university apartments. The remainder find accommodations in private homes, apartments, and trailer courts in and near Ames or commute from surrounding communities.

A list of off-campus apartments for student families may be seen at the University Student Apartment Office; however, the majority of the available rentals may be obtained from local newspapers and real estate offices.

Applications for University Student Apartments will be accepted not more than one year in advance of attending the University. Assignments are made by date of application.

Address correspondence concerning student apartments to the Director of University Student Apartments, 100 University Village, Ames, Iowa 50010.

Off-Campus Housing for Single Students

Availability and cost are factors to be considered when living off-campus, as the number of good living quarters is limited.

Sleeping rooms in older houses and apartments make up the bulk of off-campus housing.

The Single Off-Campus Housing Office, 1212 Friley Hall, keeps a partial listing of off-campus sleeping rooms and apartments. Other housing may be obtained through real estate agents, local newspapers, or by contacting individual owners.

It is best that the student come to Ames well in advance of the time he or she plans to begin academic work, as many rooms and apartments are rented 3 to 6 months in advance. Because of the variety, it is best to contact the owner directly to make arrangements for housing that will fit requirements of the individual.

The single occupancy room rental rates average $25 per week; the double occupancy room rental rates average $30 per person per week. The student usually furnishes bed linens, towels, and study lamp. Average rental rate per student sharing an apartment or house would be in the $75 to $85 range per month. Board for students living in off-campus rooms may be obtained in residence hall dining rooms, private restaurants, or the Memorial Union.
The University Library

Dean of Library Science: Warren B. Kuhn

The University Library collection affords open-shelf access to more than 1.4 million volumes. Additional holdings of 1.2 million microforms are available in a wide range of subject areas. The Library is particularly strong in the basic and applied fields of the biological and physical sciences and has a long-range program for strengthening collections in the humanities and social sciences. Very complete holdings of periodicals are maintained in botany, chemistry, entomology, mathematics, physiology, and veterinary medicine. The Library receives over 17,500 journal titles and other serial publications, amounting to world coverage in many scientific fields in major and minor languages.

The Library encourages use of its collections, services, and study facilities. Instruction in the use of books and libraries is offered to graduate and undergraduate students.

Weekly exhibits of new books in all subject areas are held on open-shelf display on the main floor. Current numbers of selected periodicals are displayed in the Periodicals and Newspaper Room. On the Library's ground floor are the Reserve Desk, the Microform and Media Center and the Leisure Reading Collection. The Library maintains a Government Publications Department and a Special Collections Department as well as a Map Room with over 70,000 maps and aerial photographs. The University Archives, covering historical documents and photographs important to Iowa State, are located in Special Collections.

There are several subject reading rooms outside the Main Library including the Engineering, Physical Sciences, Economics and Sociology, Design, and Mathematics Reading Rooms. A branch library is maintained in the College of Veterinary Medicine.

Student Counseling Service

Director: Roy E. Warman, Ph.D.


Student Counseling Service provides a broad variety of services to assist students in their self-understanding, development, and progression toward goals. Individual counseling may focus on a number of student concerns including curriculum choice, career goals, social and personal adjustment, and mental health matters. Discussions between the student and counselor are confidential. Testing is provided when appropriate, with no charge to regularly enrolled students.

Group counseling is provided on topics such as personal growth, assertiveness, career exploration, eating disorders, self-defeating behaviors, and reduction of test anxiety.

Other services include Adult Student Information Office, Academic Support Services Office, reading and study skills program, career information resource library, administration of tests for general aptitude and professional schools, and orientation testing.

Student Health Service

Director: Lilu Furman, M.D.

Physicians: Don Bock, M.D.; Arthur Cloud, M.D.; Leonard Ellerton, M.D.; Manson Fee, M.D.; Rebecca Fritzschke, M.D.; Clem Mattson, M.D.; Pauline Miller, M.D.; Robert Patterson, M.D.; Donald Powers, M.D.

The Student Health Service is located in the Student Services Building south of Pearson Hall and next to Alumni Hall. Services provided include outpatient clinic for treatment in the areas of general medicine, gynecology, psychology, and sports medicine, emergency rooms; pharmacy; laboratory; x-ray; and diet service.

Clinic hours are 8-11:30 a.m. and 1-5 p.m. Monday through Friday, and 8 a.m. to 12 noon Saturday. The clinic operates on a walk-in basis as well as on an appointment system during clinic hours. Emergency service is available 24 hours daily, seven days a week.

All records are confidential. Student records are not available without the student's permission. A copy of the record may be sent to a physician of the student's choice.

A voluntary health fee program enables students to defray their medical expenses by paying a semester fee which entitles them to receive many services free or at a reduced cost. All enrolled undergraduate students and graduate students are eligible to participate in the program. During the summer, students not enrolled in summer sessions but who were students in the spring semester may participate via the voluntary health fee or pay the non-participant student rate. Faculty, employees and visitors (on an emergency basis) will be charged the non-student rate.

Students' spouses can use the Student Health Service, provided both the student and spouse pay the voluntary health fee. The voluntary health fee program is not an insurance plan but a health maintenance plan to complement the student's individual insurance coverage.

Placement Offices

Agriculture: Roger Bruene, B.S., 118A Curtiss
Design: Janet E. Moore, M.S., 134 Design
College
Education: Trevor Howe, Ph.D., Quadrangle
Engineering: Herbert A. Harmon, Jr., M.S., 104 Biological
Home Economics: Julie R. Muckler, M.S., 131
Mackay
Sciences and Humanities: Jack Raymon, Ph.D., 104 Biological
Veterinary Medicine: Dunwood L. Baker, D.V.M., 2510 Veterinary Medicine

The University maintains offices for each of the colleges where employers and prospective employees are brought together. Each of these offices assists students and alumni who seek information on career openings in their fields. The placement offices are also a resource for students seeking summer employment.

Office of Minority Student Affairs

Director: George A. Jackson, Ph.D.
Assistant Director: Juliana Rudwill
Director, Black Cultural Center: Delores Newton
Academic Coordinator: Robert A. Broadus
Program Coordinators: Patricia A. Pinckney, Maria C. Munch, Teresa Nieves

The Office of Minority Student Affairs is designed to give leadership to the University's mission in the area of equal educational opportunity. The office strives to maximize the educational and personal growth of students by identifying and assisting to develop and promote programs which will enable students and staff to achieve to their fullest potential.
In addition, the Office of Minority Student Affairs works closely with all units in the University to achieve the following objectives:

1. Increase the number of entering and graduating minority students.
2. Review the concept of equal educational opportunity and recommend changes in university policies that may limit or prevent the achievement of educational and cultural goals of minorities.
3. Ensure access and persistence of minority students in every discipline and area of study offered by the University.
4. Maintain liaison with all departments and organizations interested in the growth and development of students.

The University Office of International Services

Coordinator of International Services: Rebecca Peterson, M.A.
Assistant Directors: Dorothy Foley, M.S.; Dennis Greisberger, M.S.
Program Coordinators: John Meyer, M.S.; Steve VanDerkamp, M.S.; Scott White, M.S.; Al Murdoch, M.S.; Garry Greenlee, M.S.
Program Adviser: Linda Marticke, M.S.

The office of University Recreational Services is dedicated to the provision of quality recreational opportunities for the campus community. University Recreational Services programs include intramural sports, sports clubs, open recreation, outdoor recreation, special events, and recreation facility scheduling, and also provide assistance for other recreational services.

For additional information, see Student Life section.

Office of International Services

Director: Martin Limbird, L.C.Sci. Econ.
Assistant Directors: Dorothy Foley, M.S.; Dennis Peterson, M.A.
Coordinator of Special Programs: John Greisberger, M.S.Ed.

Program Coordinators: Julie Rose, M.S.F.S.; Margarettean Weltha, M.A.; Lorie Wardlaw, M.A.
Coordinator of International Services: Rebecca Peterson, M.A.

The Office of International Educational Services provides assistance, information, and programming for three principal groups: the nearly 2,000 foreign students, scholars, and short-term visitors on campus each year; the over 2,000 American students and faculty seeking advice on overseas work, study, and travel; the 100,000 Iowaans who use items from other cultures which are available through the office. Services to foreign nationals include group orientation activities and intercultural programs throughout their stay as well as advice and counseling on immigration, legal, and personal concerns. Seminars for overseas travelers are scheduled each semester in addition to individual counseling on overseas study, work, and travel opportunities and fellowships, such as Fulbright-Hays grants.

Educational materials reflecting the cultures of 140 countries are developed and distributed by the International Resource Center to campus and state-wide community groups. Service to these three groups contributes to improving intercultural understanding on campus and throughout the state.

Office of Student Life

Dean of Student Life: Jon C. Dalton, Ed.D.
Assistant Dean of Student Life: Augustine E. Wright, Ph.D.
Program Supervisor: James E. Moore, M.A.
Orientation Coordinator: Margaret A. Healey, M.A.
Handicapped Student Services Coordinator: Janet K. Rus, M.S.E
Program Advisers: Clarinda M. Nelson, M.S.; Barbara H. Snyder, M.S.
Program Adviser-Greek Affairs: Jan Schubert, M.S.
Coordinator of Women's Programs: Rachel Christiansen, M.M.Ed.
Alcohol Education Programmer: James M. Krath, M.S.

The Office of Student Life administers several student service programs including university orientation, fraternities and sororities, student conduct and judicial boards, registration and advising for student organizations and activities, women's programs, alcohol educational programs, handicapped student services, student information services, and the student advocate service.

The Office of Student Life provides a wide range of educational programs for individuals and student groups on such topics as leadership, goal setting, values clarification, interpersonal communications, life planning, and organizational development.

Staff members advise numerous student organizations and activities, including the Government of the Student Body, Black Student Organization, the Greek system, and Campus Chest. The HELP Center, a student information service, is located in room 125 Memorial Union and is staffed by the Office of Student Life.

Financial Aid and Student Employment Office

Director: Jerome H. Sullivan, M.P.A.
Assistant Directors: Larry Dietz, M.S.; Richard Lephart, A.B.
Coordinators: Surjit K. Bhella, Ph.D.; Marta Blytuym, M.S.
Advisers: Debra Hawkins, B.S.; Philip F. Hawkins, M.S.; Madelyn Peregrine, M.A.

The Financial Aid and Student Employment Office offers assistance with financial concerns. Scholarships, grants, loans, and part-time employment (work-study) are available singly or in various combinations to meet the difference between the amount the student and his or her parents can reasonably be expected to provide and the cost of attending the University.

Eligibility for financial aid is based on financial need as determined by the Family Financial Statement (FFS). Students must submit the FFS, including the Basic/Pell Grant section, by March 1 prior to the fall term of enrollment in order to receive priority consideration. Applications received after March 1 will be given secondary consideration and awarded if funds are available. To be eligible for financial aid you must be a U.S. citizen or permanent resident, enrolled on at least a half-time basis, and making satisfactory academic progress toward a degree.

Consideration for financial aid is given for only one academic year. Therefore, it is necessary to complete a new FFS each year.

Where to Apply

Financial Statements and financial aid brochures with sample budgets are available upon request from the Financial Aid and Student Employment Office, Room 12, Beardshear Hall. High school counselors also have FFS forms. The Financial Aid Form (FAF) will be accepted in place of the FFS, although the FFS is preferred.

Brief Description of Financial Aid Programs

Financial aid programs generally consist of three types: gift aid (scholarships and grants), loans, and part-time employment.

I. Gift Aid
A. Scholarships

1. Admission with Recognition and Award. High school graduates in the upper five percent of their class and students transferring from an Iowa two-year college with a 3.50 grade-point average are recognized for their high academic performance by a certificate of recognition and a $100 award. These awards are made at the time of admission to the University. No application is necessary.

2. ISU Scholarship/Grants. These awards are based on need as determined by the Faculty Financial Statement. The FFS, including the Basic/Pell Grant section, must be completed in order to be considered.

3. State of Iowa Scholarships. Iowa residents can obtain information and application forms from high school counselors or by writing to the Iowa College Aid Commission, 291 Jewett Building, 8th and Grand, Des Moines, Iowa 50309.
4. College and Departmental Scholarships. A number of scholarships are awarded to deserving students. For further information on these scholarships, please consult the listings of scholarships by college in this catalog or write directly to the college for information.

5. National Merit Scholarship Program. Students who become finalists in the National Merit Scholar competition are eligible for scholarships offered by the Iowa State University Alumni Achievement Fund. Finalists may receive a maximum scholarship of half their financial need up to $2000 per year. Finalists who do not have financial need will receive a $1000 scholarship.

6. Other Scholarship Sources. Students are encouraged to pursue funds from local agencies and private organizations.

B. Grants
1. Basic/Pell Grants. The maximum award under this federal program is $1900 if available funds permit. All undergraduate applicants for financial aid must apply for the Basic/Pell Grant by completing the Basic/Pell Grant section of either the FAF or FAF. FFS and FAF forms may be obtained from school counselors and college financial aid offices.

2. Supplemental Educational Opportunity Grants (SEOG). An eligible undergraduate student may be awarded a grant of $200 to $2000 on the basis of financial need. The FSS, including the Basic/Pell Grant section, must be completed in order to be considered.

3. Officer Education (ROTC) Financial Assistance Grants. All students enrolled in Advanced ROTC (third and fourth years) in the Army, Navy, and Air Force programs are provided a financial assistance grant of $1000 per month for up to 10 months per year. The Navy program also includes a 4-year program which provides $100 per month for up to 10 months per year. For further information, contact the appropriate ROTC Department.

II. Loans
A. National Direct Student Loans (NDSL). An eligible student may borrow, on the basis of need during the second year of undergraduate study, $3,000. A maximum of $5,000 for total undergraduate study is allowed. A total of $12,000 may be borrowed for undergraduate and graduate programs. Interest 4 percent on the unpaid balance begins with repayment of the loan principal 6 months after cessation of enrollment. The repayment period can be extended over a period of 20 years with repayment related to the borrower’s income.

B. University Long-Term Loans (ULTL). Private donors contribute the funds for this loan which is awarded on the basis of need to undergraduate and graduate students. The interest rate is 4 percent per year begins with repayment of principal 6 months after cessation enrollment. Defeasement provisions are available in some instances. The FSS, including the Basic/Pell Grant section, must be completed in order to be considered.

C. Health Professions Loans and Scholarships. These programs are limited to students accepted for enrollment in the College of Veterinary Medicine. The loan funds have a 7 percent interest rate. Defeasement and cancellation provisions are available in some instances. An FFS is required.

D. University Short-Term Loans. Students enrolled and in need of temporary assistance to pay educational expenses may apply for this loan. The loan is available each semester and must be repaid before final examinations of the following year. Students who face unexpected emergency expenses may also apply for this loan.

Students enrolled or planning to enroll on less than half-time basis will be eligible for only the amount of tuition and fees assessed on the fee card and educational supplies. Both educational supplies and living expense amounts can be borrowed provided the student is full-time. Students interested should contact the Financial Aid and Student Employment Office for more information concerning loan limits and guidelines. Short-term loans are also available for part-time students on a reduced basis.

E. Federally Insured/Guaranteed Student Loans (FISL). Hometown banks, credit unions, and savings and loan associations provide funds through this program. The interest of 4 percent per year begins with principal payments 6 months after the student ceases to be enrolled on a half-time basis. Repayment will be made over a period ranging from 5 to 10 years or less depending upon the total amount borrowed. Deferments are granted in some instances. Applications are available from the lender or from the Financial Aid and Student Employment Office.

III. Part-time Employment
Employment opportunities are available in which students may earn a portion of their educational expenses. The student job board outside of 12 Beardshear is used for advertising part-time employment opportunities for ISU students through the centralized Student Employment Service. The College Work-Study Program and other university employment opportunities are the main sources of jobs, although off-campus and odd jobs are also posted. All students seeking on-campus employment should pick up a student employment verification card from the Financial Aid and Student Employment Office before looking for a job.

A. College Work-Study Program. The College Work-Study Program is a need-based program that permits students to be employed on campus or off campus by public or nonprofit agencies with a portion (up to 80 percent) of their total earnings paid by federal funds and the remainder by the employing department or agency. Students participating in the College Work-Study Program must be awarded financial aid and must have employment eligibility as a part of their award package. The total financial aid award including work-study or any on-campus employment may not exceed the determined need. Students may work a maximum of 40 hours per week and placement counseling is available to students upon request by the Financial Aid and Student Employment Office. The FSS, including the Basic/Pell Grant section, must be completed in order to be considered.

B. University Student Employment. University employment is available to all students, with the employing department paying all of the wages. Students who are receiving financial aid should not begin any university employment without first consulting the Financial Aid and Student Employment Office. Many students who live in university residence halls apply for work in the food service to help meet the cost of room and board. Students interested in food service employment may apply directly to the Assistant Director of Residence in Charge of Food Service, Residence Department, Fritzay Hall, Iowa State University, Ames, Iowa 50012.

C. Off-Campus Employment. The off-campus employment program seeks part-time employment opportunities for students who would like to work while they are in school. Restaurants, hotels, service stations, and retail sales stores are examples of local employers that list positions with this program. Jobs are available to any ISU student, graduate or undergraduate, regardless of his/her financial need. Students receiving other forms of financial aid, however, may be limited to the amount that they can earn off-campus. Jobs are listed on a board outside the Financial Aid and Student Employment Office, Room 12, Beardshear Hall.

All state and federal aid programs are subject to review by their respective governing agencies, and may be changed without notice.

IV. Other Financial Aid
Many other forms of financial aid are available to students who qualify, including Vocational Rehabilitation, Veterans Benefits, Aid to Dependent Children, and Social Security. For further information on these programs, contact the appropriate government office.

Military Officer Education (ROTC) Scholarships
Army
The Military Science Department offers 4-, 3-, and 2-year Army ROTC scholarships to qualified students on a competitive basis in virtually any academic discipline. These scholarships provide payment of tuition, books, laboratory fees, and supplies, and a cash subsistence allowance of $100 per month. For applications or additional information, contact the Military Science Department at Room 132 Armory or call 294-1852.

Navy
The Naval Science Department offers two scholarship programs that include payment of full tuition, fees, and books, plus $100 a month. These programs are as follows:
1. The NROTC 4-year scholarship.
2. The NROTC 2-year scholarship.

Information is available from the Naval Science Department, telephone 294-6030.

Air Force
The Air Force Aerospace Studies Department offers Air Force ROTC scholarships covering 4, 3, or 2 years of college which are available to qualified students. The scholarships provide payment of tuition, book fees, laboratory fees, and $100 a month. Scholarship opportunities are available in the pilot, navigator, and missile career fields and in certain technical academic majors.

Details on scholarship qualification application procedures and eligibility are available from the Department of Air Force Aerospace Studies, telephone 294-1716.
Student Life

University Recreation Services

The office of University Recreation Services is dedicated to the provision of quality recreational opportunities for the campus community. Programs include intramural sports, sports clubs, open recreation, outdoor recreation, special events, and recreation facility scheduling. Assistance for other recreational services is provided.

The open recreation program includes the opportunity for free physical sports activity in Beyer Hall, State Gymnasium, Armory, Physical Education Building (east campus), Hilton Coliseum, outdoor tennis courts near Beyer Hall and Physical Education Building, outdoor basketball courts near Beyer Hall, intramural fields east of the Towers and Maple-Willow-Larch Residence Halls, playfields north of Beyer Hall, and Clyde Williams Field.

The Outdoor Recreation Program is composed of four basic elements: the camping-outdoor equipment checkout program; the organized trip program; basic instruction activity workshops; the Outdoor Equipment and Resource Center.

All of these programs and activities are designed to provide opportunities for natural environment experiences. The George E. Veenker Memorial Golf Course, with a new clubhouse, is located north of campus on Stange Road. Old 1 and 18 golf holes north of the Armory are open for ISU recreation golf use at no charge. For more information, drop in at the Outdoor Equipment and Resource Center, Room 43 in the Armory (294-8200).

The Sports Club Program is designed to serve individual interests in different sports club activities and is student oriented in every respect. Sports clubs offer team or individual physical recreational opportunities. Following are the 38 sports clubs: aikido, archery, backpacking, badminton, bowling, boxing, canoe, chess, cricket, cycle, cyclone sabres (lancing), dress blues, equestrian, flying, handball, hapkido, hockey, judo, lacrosse, mountaineering, parachute, parachuting, rifle and pistol, rodeo, rugby, sailing, scuba, shorin-ryu, ski, soccer, table tennis, tae-kwon-do karate, tennis, trap and skeet, volleyball, water polo, weightlifting and ISU whitewater association.

These clubs offer instruction and competition at the local and intercollegiate levels. Dues are set by the club members, and all clubs receive financial subsidy from the Government of the Student Body to enable students to participate regardless of their financial situation.

The intramural program involves competition among participants who enter as teams or individuals and play according to specific schedules. There are a total of 36 intramural activities ranging from football to inlernet water basketball and curling.

Numerous special events add spice to the recreation program. These activities are of an endless variety and usually take place in a short time span. In general, they encompass demonstrations, performances, special contests, mass group participation, social occasions, excursions, displays or special instruction.

Other physical, cultural, and social recreation programs are sponsored in coordination with various departments, organizations, and groups on and off campus. For further information concerning campus recreation activity, contact the University Recreation Services office, 107 State Gym, or call 294-4980.

Forensics: Debate and Individual Events

The ISU forensics squad, sponsored by the Department of Speech, participates in several kinds of forensics activities. In addition to competing in intercollegiate debate and the full range of individual events (public address and oral interpretation), they provide service to professional and educational organizations.

Each year the squad travels over 30,000 miles to compete in approximately 35 tournaments. They sponsor both high school and college speech tournaments, in addition to on-campus public speaking activities. The University is a member of the Iowa Intercollegiate Forensic Association, Twin Cities Forensic League, Missouri Valley Forensic League, the Cross Examination Debate Association, and has a chapter of Delta Sigma Phi. Tau Kappa Alpha, national forensics honorary. Participation in forensics is open to all students, with or without experience.

Lectures

During the academic year the University Lecture Series brings to the campus a number of speakers eminent in national and international affairs, the sciences, and the arts. In addition to giving formal lectures, a number of these speakers meet with students informally for discussions. Through these lectures and discussions the students are given a well-rounded presentation on subjects and areas affecting their culture, educational and economic philosophy, and scientific development. A World Affairs Institute, concentrating on one aspect of international interest and drawing on experts in the field, and a National Affairs Institute, concerned with a topic of current interest in the United States, are held each year. Focus, an annual fine arts festival with emphasis on student creativity in the arts, is held in the spring. From time to time University Lecture Series also sponsors or cosponsors dramatic, dance, and musical events.

The summer session is highlighted by a number of lectures on a wide range of topics by members of the faculty with expertise in the subject area they are addressing. In addition, some dramatic, dance, and musical events are scheduled.

Memorial Union

The Memorial Union is the center of much informal education on campus. It is a meeting place and headquarters for most of the larger student organizations. Dances, banquets, lectures, concerts, shows, exhibits; and other large campus gatherings are accommodated in its meeting halls and ballrooms. Recreational facilities include bowling alleys, table tennis, billiards, television, and a music listening room, as well as quiet lounges and a browsing library. A small chapel occupies one corner of the building.

A cafeteria, private dining rooms, a restaurant, and a snack bar cater to guests of the University as well as to students and faculty. The Maintenance Shop Bar is an informal gathering spot for students and faculty; weekends feature live entertainment. The Crafts Center has facilities and materials for individuals to express themselves creatively and the Outlet is a place to buy and sell original art work. Overnight guest rooms may be occupied by campus visitors. The Memorial Union also has a complete book store.

Launched by alumni as a memorial to the service of sons and daughters of the University in World War II, the Memorial Union has now become a memorial to all Iowa State men and women who have served in the armed forces of our country. Replacement cost of the building is nearly $15 million. The Memorial Union is owned and operated by students and alumni of Iowa State and is financed from dues and from fees received for services.

End
Music Activities

Many opportunities to perform and listen to music are provided Iowa State students. The Department of Music offers a full instructional program including applied vocal and instrumental instruction, music theory, music history and literature, and music education.

Large student performing organizations include several choruses, bands, and the ISU Symphony Orchestra. Smaller student ensembles include Chamber Singers, Musica Antiqua, Opera Studio, Jazz Ensemble, and Cardinal Keynotes. In addition to Brass Choir, wind players have the opportunity to perform in several brass and woodwind ensembles.

Campus concerts, student operas, musical shows, the Christmas Festival of Music, the Madrigal Dinner, and concert tours are among the musical events offered.

Several concert series such as the Music, Variety, Dance, Theater, Young Concert Artists, and Town and Gown Chamber Music, bring professional performers of high caliber to the campus and the city of Ames. The Ames International Orchestra Festival has received worldwide acclaim for annually bringing at least one major symphony orchestra to Ames for a series of concerts. In addition, many members of the music faculty appear in recitals.

Gamma Alpha Iota and Phi Mu Alpha, professional music fraternities for women and men, are represented on campus.

Honor and Professional Organizations

Iowa State University has chapters of 32 national honor societies, which elect members primarily on achievement in scholarship or research. Those which elect students from a college or from the University at large are:

- Alpha Lambda Delta - first-year students
- Alpha Zeta - Agriculture
- Gamma Sigma Delta - Agriculture
- Kappa Delta Pi - Education
- Omicron Nu - Home Economics
- Phi Beta Kappa - Sciences and Humanities
- Phi Delta Kappa - Education
- Phi Eta Sigma - first-year students
- Phi Kappa Phi - all-university
- Phi Upsilon Omicron - Home Economics
- Phi Zeta - Veterinary Medicine
- Sigma Xi - Science
- Tau Beta Pi - Engineering

Professional societies choose their members from students, with special departmental affiliations, who meet scholastic and character requirements. Most curricula of the University have such professional societies. There are also departmental clubs and organizations that meet special interests.

Activities honoraries focus their requirements for membership on the basis of interest, participation, or special achievements in all-university activities. Mortar Board and Cardinal Key are the highest activities honoraries. Both groups select members on leadership, service to Iowa State, scholarship, and character. Several other activities honoraries recognize students in various special areas.

Religious Life

Iowa State is a state-supported, nonsectarian institution, but it recognizes the importance of spiritual life and cooperates with the many off-campus groups that fulfill the religious needs of the community.

Most of the larger denominations have churches within easy walking distance of the campus. A number of these have built attractive student centers in connection with the churches and conduct extensive student programs under the direction of professionally trained persons. In addition, a number of campus student organizations also address the religious needs of many students.

YWCA and YMCA

The YWCA and YMCA are located in Alumni Hall, near central campus. They design programs which bring students to active participation in campus and community life and challenge them to a deeper exploration of their value commitments.

Theatre and Dramatics

The Iowa State University Theatre, Department of Speech, produces a season of at least five major presentations each year. The season's bill endeavors to offer a variety of theatrical fare, including a musical, a children's play, well-known dramatic literature and unusual and lesser-known plays. Practical experience in all phases of theatrical production is open to all interested, registered students within the University. The season is partially subsidized by an allocation from the Government of the Student Body; therefore, all students paying activity fees may attend a performance without presentation of their activity fee card plus a small validation charge.

Other theatre-sponsored programs include Speech 556, directing practicums; Shamus Players; student-produced plays; readers theatre programs; I-Alum, a local theatre honorary; Theta Alpha Phi, a national dramatics honorary; and a summer theatre program.

Fraternities and Sororities

The 32 fraternities and 16 sororities at Iowa State University have approximately 3,100 student members (2,000 men and 1,100 women). Combined, they provide housing facilities for 2,700 undergraduate students at Iowa State.

The chapter house facilities are similar to a private residence — living room, den, kitchen, dining room, laundry room, etc. Local alumnus work with each fraternity and sorority to ensure that the chapter structure meets all the state and local building, safety, and fire codes that are required with incorporation under the State Law of Iowa. These alumni also assure that the chapter is meeting the educational objectives of the University and the individual chapter.

The cost of living in a fraternity (room, board and social dues) averages $870 each semester. Initiation fees (paid once for life) range from $25 to $40 for a pledging fee, and $50 to $140 for the activation fee. Freshmen men move directly into the fraternity house as the academic year begins and generally remain throughout their college career.

Sororities at Iowa State University have an average house bill of $825 per semester for room, board, and social dues. Pledging fees vary from $20 to $45 (average: $26.75). Initiation fees average a one-time cost of $80, with an additional cost of a sorority pin. Some houses include the pin in initiation dues, making the average cost about $111.

Freshmen women pledged during formal rush or informally throughout the year generally live in the residence halls for the academic year. However, as chapter space allows, there is an option for freshmen and upperclass women to move into their sorority house upon invitation by the chapter, providing they abide by their residence hall contracts.

Activities include Interfraternity Council, Panhellenic Council, Greek Week, Greek Programming Committee, various task forces on fraternity/sorority issues, as well as each individual chapter leadership.

Fraternities and sororities have been active with Iowa State University since 1875. Since that time, over one-third of Iowa State's total alumni have graduated with fraternity/sorority affiliation.

Student Conduct

Iowa State students are expected to seriously pursue their educational goals and conduct themselves in a manner that preserves an appropriate atmosphere of learning. All students who enroll at Iowa State are expected to assume the responsibilities of citizenship in the campus community.
Research and Service Agencies

Research is an important activity at Iowa State. Most faculty members engage in research pursuits as well as teaching. Graduate students, and in some cases undergraduates, receive stimulation which comes from being a part of the never-ending search for new knowledge. Therefore, new developments and new ideas pervade the campus.

A year's operating budget for all research at the University is approximately $53 million, much of it from contracts or grants involving the federal government and industry.

As part of its total program the University also operates extension services, special laboratories, and institutes.

An abbreviated description of the various research and service agencies and their administrative personnel is presented here. Additional information concerning any of these organizations may be obtained from the offices located on the campus.

Agriculture and Home Economics Experiment Station — Lee R. Kalmer, director; John P. Mahlstedt, associate director; Ruth E. Deacon, Thamon E. Hazen, Ronald C. Powers, assistant directors. Experimental work is conducted at Ames, twelve outlying research centers, and in the fields of many farmer cooperators. Programs include both basic and applied research in agriculture and home economics.

Ames Laboratory of the United States Department of Energy — Robert S. Hansen, director; Velmer A. Fassell, deputy director; Eugene Catus, associate director; William J. Kernan, associate director; Kenneth L. Kliever, associate director; Adolf F. Voigt, assistant director. The Laboratory staff conducts basic investigations that seek to discover new scientific knowledge and improve understanding of natural laws and phenomena related to energy conversion technologies. The Laboratory prepares scientists for work through research appointments to Iowa State University graduate students.

Center for Agricultural and Rural Development — Earl O. Headley, director. The staff conducts research and related activities relating policy to income, employment, the structure and development of agriculture, natural resources, the environment, and rural communities both domestically and internationally.

Computation Center — Clair G. Maple, director; Dale D. Groenroth, associate director; Robert J. Lambert, associate director; George O. Strawn, associate director; Michael D. Bowman, assistant to the director; George F. Covert, assistant director, systems; John B. Linderblood, assistant director, operations; Jerome Nielson, assistant director, interactive computing. The Center provides an all-university computing service and a centralized facility for research and education in the computer sciences.

Energy and Mineral Resources Research Institute — Robert S. Hansen, director; Velmer A. Fassell, deputy director; Eugene Catus, associate director; William J. Kernan, associate director; Kenneth L. Kliever, associate director; Adolf F. Voigt, assistant director. The Institute coordinates and administers energy-related research programs, most extensively federally-funded projects (through the Ames Laboratory) and state-funded activities such as the Iowa Coal Project.

Engineering Research Institute — D. R. Boylan, director. The Institute coordinates staff research in areas involving all engineering academic departments and maintains major laboratories and technical service groups to support the various research programs. Funds are derived from state appropriations and from industrial and government grants or contracts. Activity is largely directed toward graduate instruction.

Home Economics Research Institute — Ruth Deacon, director. The staff of the Institute promotes and conducts research as a part of the various programs in the College of Home Economics.

Industrial Relations Center — Paul M. Muchinsky, director. The central focus of research is on the behavior of individuals and organizations in an employment and labor force relationship. It provides an interdisciplinary approach to related studies.

North Central Regional Center for Rural Development — Ronald C. Powers, director. The Center is supported by the land-grant universities of the North Central Region and the U.S. Department of Agriculture. The major purpose of the Center is to conduct a multi-disciplined research and extension program addressed to improving the social and economic opportunities of both farm and nonfarm people of nonmetropolitan, or rural, America.

Nutritional Sciences Council — Jerry W. Young, chairman. The Nutritional Sciences Council consists of faculty members and qualified collaborators who are engaged in research, extension, or teaching in the nutritional sciences and closely related disciplines. The Council develops symposia on topics of international interest, sponsors an Interdepartmental seminar, "Modern Views of Nutrition," and arranges short courses designed to fill specific needs in the total nutrition program.
Research Institute for Studies in Education  
Richard D. Warren, director. The Institute coordinates and conducts research directly concerned with, but not limited to, educational personnel development in the major areas of elementary, secondary, higher, and continuing education. Its research functions interface with other programs in the College of Education in-service development, extension services, and service programs to school districts, area schools, community colleges, the State Department of Public Instruction, regional education centers, and national research and development centers.

Sciences and Humanities Research Institute  
Wallace A. Russell, director; Thomas W. Tumage, associate director. Research programs in the College of Sciences and Humanities are sponsored, coordinated, and administered through the Sciences and Humanities Research Institute. Its primary objective is to encourage basic research and creative scholarship in the five major areas included in the college — the humanities, the social sciences, the biological sciences, the physical sciences, and the mathematical disciplines. These activities are carried out with support from the institute, by faculty members of the college, and by graduate students working in these areas. In addition, the institute works closely with other research agencies, both on campus and off, and administers externally funded sponsored research within the college.

In extending the frontiers of knowledge, these activities contribute directly to the University's educational mission. In addition, they provide ideas and results which may aid in the solution of both present and future problems of the state and the nation.

Soil Science Institute  
Wayne H. Schottes, director. The Soil Science Institute is a multidisciplinary institute with the objective of conducting instruction of the most current information in the subject-matter areas supportive to the field of soil genesis and classification. Since its inception at Iowa State University in 1966, it has been offered every other year for selected soil scientists from the U.S. Department of Agriculture.

Statistical Laboratory  
Herbert A. David, director. A research and service institute which conducts research in statistical theory and methodology. It promotes and fosters the use of sound statistical methods in university research through on-campus consulting.

Veterinary Medical Diagnostic Laboratory  
Vaughn A. Seaton, head. The laboratory provides a facility to which the Iowa animal industry and veterinary medical profession can bring animal health problems for counsel and diagnostic assistance.

Veterinary Medical Research Institute  
Phillip T. Pearson, director; Melvin S. Hofstad, professor in charge. The Institute is multi-disciplinary with a responsibility to conduct research and offer research training in animal diseases. Research and research training are conducted in the areas of viral, bacterial and parasitic diseases, immunology and basic biology.

Water Resources Research Institute  
Mervin D. Dougal, director; Daniel J. Zaffarano, administrative coordinator. The Institute coordinates and administers an interdisciplinary program in water resources research. It administers the federal funds received from the Office of Water Research and Technology, U.S. Department of the Interior, as made available through the Water Resources Research Act of 1976, as amended. Funds received from private, state, and federal sources are allocated for research in all aspects of water resources directed primarily at solving state, regional, and national water problems. Graduate research training, technology transfer, and information dissemination are additional elements of the program.

World Food Institute  
Charlotte E. Roderick, director. The World Food Institute of Iowa State University was officially established in 1972 by the Iowa Board of Regents to focus Iowa State University's competencies and leadership upon the provision of adequate and nutritious food supplies for the world's peoples through research and education. The World Food Institute's five major goals are: (1) To analyze food and nutrition problems; (2) To generate solutions to food and nutrition problems and to suggest means for implementation of solutions; (3) To build competencies in people for the generation and implementation of solutions of food and nutrition problems; (4) To collect, analyze, and disseminate information bearing on food and nutrition problems; and (5) To study interrelationships between the United States, with particular emphasis on Iowa, and other countries of the world.

The Institute sponsors an undergraduate course on world food problems through University Studies, seminars, faculty projects, an annual World Food Institute lecture, WFI Distinguished Foreign Scholars, and WFI International Fellows.

University Extension

Charles E. Donhowe, Dean

Through the combined University Extension program, the total resources of Iowa State can be brought to bear upon urban and rural problems. University Extension includes all extension programs emanating from Iowa State. Most of the efforts are organized through the extension units.

Cooperative Extension Service in Agriculture and Home Economics  
Charles E. Donhowe, director. Among the programs offered are agricultural production, conservation of national resources, efficient marketing and distribution of farm-raised products, family living, 4-H club work, youth development, community improvement and resource development.

Engineering Extension  
R. E. Patterson, Jr., director. Both non-credit courses and video-taped graduate-credit courses taught by faculty members from the College of Engineering are offered throughout the state.

Center for Industrial Research and Service (CIRAS)  
David H. Swanson, director. An advisory service to Iowa Industry and Business. The Center facilitates the dissemination of counsel and assistance in solving the operational problems of industry and business in the private sector.

Office of Continuing Education  
George H. Ebert, leader. Extension courses, off-campus university credit courses, and informal continuing education programs are offered as part of the broad educational and service base of the University.
Colleges and Curricula

The University is organized into eight colleges, including the Graduate College. These colleges offer degree programs in the following curricula and majors (For a complete list of majors at the graduate level, see the summary at the end of the Graduate College section of this catalog).

The main academic programs of each college are listed here, together with the degrees or certificates awarded upon completion. In many cases, certain majors, options, or electives allow for increased specialization within the programs. Programs which are administered jointly by two colleges are listed within both colleges.

**College of Agriculture**
- Agricultural Biochemistry, B.S.
- Agricultural Business, B.S.
- Agricultural Economics, M.S., Ph.D.
- Agricultural Education, B.S., M.S., Ph.D.
- Agricultural Engineering, B.S., M.Eng., M.S., Ph.D.
- Agricultural Extension Education, B.S.
- Agricultural Journalism, B.A., M.A.
- Agricultural Mechanization, B.S.
- Agronomy, B.S., M.S., Ph.D.
- Animal Ecology, B.S., M.S., Ph.D.
- Animal Science, B.S., M.S., Ph.D.
- Biometry, B.S.
- Dairy Science, B.S.
- Entomology, B.S., M.S., Ph.D.
- Farm Operation, B.S.
- Fisheries and Wildlife Biology, B.S., M.S., Ph.D.
- Food Technology, B.S., M.S., Ph.D.
- Forestry, B.S., M.S., Ph.D.
- Genetics, M.S., Ph.D.
- Horticulture, B.S., M.S., Ph.D.
- International Agriculture, B.S.
- International Studies, B.S.
- Pest Management, B.S.
- Plant Pathology, B.S., M.S., Ph.D.
- Public Service and Administration in Agriculture, B.S.
- Rural Sociology, M.S., Ph.D.
- Seed Science, B.S.

**College of Design**
- Architecture, B.A., B.Arch., M.Arch.
- Community and Regional Planning, B.S., M.C.R.P.
- Landscape Architecture, B.L.A., M.L.A.

**College of Education**
- Education, M.Ed., M.S., Ph.D.
- Elementary Education, B.S.
- Environmental Studies, B.S.
- Industrial Education, B.S., M.Ed., M.S., Ph.D.
- Leisure Studies, B.A.
- Physical Education, B.S., M.S.
- Secondary Education (See certification programs offered by the colleges of Agriculture, Design, Home Economics, and Sciences and Humanities.)

**College of Engineering**
- Aerospace Engineering, B.S., M.Eng., M.S., Ph.D.
- Agricultural Engineering, B.S., M.Eng., M.S., Ph.D.
- Chemical Engineering, B.S., M.Eng., M.S., Ph.D.
- Civil Engineering, B.S., M.S.
- Construction Engineering, B.S.
- Geodesy and Photogrammetry, M.S.
- Geotechnical Engineering, M.S., Ph.D.
- Municipal Engineering, M.S.
- Sanitary Engineering, M.S., Ph.D.
- Structural Engineering, M.S., Ph.D.
- Surveying, B.S.
- Transportation Engineering, M.S., Ph.D.
- Electrical Engineering, B.S., M.Eng., M.S., Ph.D.
- Computer Engineering, B.S.
- Engineering Mechanics, B.S., M.Eng., M.S., Ph.D.
- Engineering Science, B.S.
- Industrial Engineering, B.S., M.Eng., M.S., Ph.D.
- Engineering Journalism, B.S.
- Engineering Operations, B.S.
- Engineering Visualization, M.S., Ph.D.
- Materials Science and Engineering, B.S., M.Eng., M.S., Ph.D.
- Ceramic Engineering, B.S., M.Eng., M.S., Ph.D.
- Metallurgical Engineering, B.S.
- Metallurgy, B.S., M.S., Ph.D.
- Mechanical Engineering, B.S., M.S., Ph.D.
- Nuclear Engineering, B.S., M.Eng., M.S., Ph.D.

**College of Home Economics**
- Child Development, B.S., M.S., Ph.D.
- Family Environment, B.S., M.S., Ph.D.
- Food and Nutrition, B.S., M.S., Ph.D.
- Home Economics Education, B.S., M.S., Ph.D.
- Home Economics Journalism, B.S.
- Home Economics Studies, B.S.
- Institution Management, B.S., M.S., Ph.D.
- Textiles and Clothing, B.S., M.S.

**College of Sciences and Humanities**
- Anthropology, B.A., B.S., M.A.
- Biochemistry, B.S., M.S., Ph.D.
- Biology, B.S.
- Biophysics, B.S., M.S., Ph.D.
- Botany, B.S., M.S., Ph.D.
- Business Administration, B.B.A., B.S.
- Accounting, B.B.A.
- Finance, B.B.A.
- Management, B.B.A.
- Marketing, B.B.A.
- Transportation and Logistics, B.B.A.
- Chemistry, B.A., B.S., M.S., Ph.D.
- Computer Science, B.S., M.S., Ph.D.
- Distributed Studies, B.A., B.S.
- Earth Science, B.A., B.S., M.S., Ph.D.
- Geology, B.A., B.S., M.S., Ph.D.
- Meteorology, B.A., B.S., M.S., Ph.D.
- Economics, B.A., B.S., M.S., Ph.D.
- English, B.A., B.S., M.A.
- Environmental Studies, B.A., B.S.
- Foreign Languages and Literatures
  - French, B.A.
  - German, B.A.
  - Russian, B.A.
  - Spanish, B.A.
- History, B.A., B.S., M.A.
- History of Technology and Science, M.A., Ph.D.
- Individual Major, B.A., B.S.
- International Studies, B.A., B.S.
- Journalism and Mass Communication, B.A., B.S., M.S.
- Liberal Studies, B.L.S.
- Mathematics, B.S., M.S., Ph.D.
- Metallurgy, B.S., M.S., Ph.D.
- Microbiology, B.S., M.S., Ph.D.
- Music, B.A., B.Mus.
- Naval Science, B.S.
- Philosophy, B.A.
- Physics, B.S., M.S., Ph.D.
- Political Science, B.A., M.A., M.P.A.
- Psychology, B.S., M.S., Specialist, Ph.D.
- Sociology, B.A., B.S., M.S., Ph.D.
- Speech, B.A., B.S.
- Statistics, B.S., M.S., Ph.D.
- Zoology, B.S., M.S., Ph.D.

**College of Veterinary Medicine**
- Veterinary Anatomy, M.S., Ph.D.
- Veterinary Clinical Sciences, M.S.
- Veterinary Medicine, D.V.M.
- Veterinary Microbiology, M.S., Ph.D.
- Veterinary Pathology, M.S., Ph.D.
- Veterinary Physiology, M.S., Ph.D.
- Veterinary Preventive Medicine, M.S.

**Graduate College**
The Graduate College administers the graduate programs listed above, as well as the following interdepartmental programs:
- Biomedical Engineering, M.S., Ph.D.
- Energy Systems Engineering (minor only)
- General Graduate Studies, M.A., M.S., Ph.D.
- Geology (minor only)
- Housing (minor only)
- Immunobiology, M.S., Ph.D.
- Industrial Administrative Sciences, M.S.
- Industrial Relations, M.S.
- Molecular/Cellular, and Developmental Biology (major only)
- Technology and Social Change (minor only)
- Transportation Planning, M.S.
- Water Resources (major only)

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**Notes:**
- College of Agriculture
- College of Design
- College of Education
- College of Engineering
- College of Home Economics
- College of Sciences and Humanities
- College of Veterinary Medicine
- Graduate College
Bachelor’s Degree Requirements

A cumulative quality-point average of at least 2.00 in all work taken at Iowa State University is required for graduation.

A student admitted as a transfer from another college or university to Iowa State is required to have a 2.00 cumulative average. A student may, however, be admitted with a quality-point deficiency, but will be required to earn sufficient quality points above a 2.00 at Iowa State to offset the quality-point deficiency at the time of entrance.

A student who takes work at another college or university after having been enrolled at Iowa State must submit transcripts of all work attempted to the Office of Admissions at Iowa State. This work must average a 2.00 or the deficiency of quality points will be assessed against the student. Failure to submit such transcripts will be grounds for dismissal.

In unusual circumstances, the academic standards committees of the respective colleges may review and give further consideration to the records of students who, except for grade-point average, have satisfactorily completed all graduation requirements. If the appropriate college academic standards committee considers that the educational and professional needs of such a student have been satisfactorily met, or can be satisfactorily met by imposing further conditions, then the committee may recommend to the dean of the college that the student be graduated or that a supplemental program be accepted in place of the fully unequalized grade-point average. The college academic standards committee chairperson reports such exceptional actions to the University Academic Standards Committee.

The final 32 credits must be taken in residence at Iowa State University in order to qualify for the baccalaureate degree, although six of the last 32 credits may be transferred to Iowa State if applied as electives and earned at a four-year college.

A student may receive two bachelor’s degrees if the or she meets the requirements of each curriculum and acquires at least 30 credits beyond the requirements of the curriculum requiring the greater number of credits. Each degree program must be approved by the appropriate department chair or head.

A student fulfilling the requirements of two separate curricula in different colleges may, in certain cases, receive a degree from one of the colleges with double majors crossing college lines. The permissions of both deans must be obtained and each degree program must be approved by the appropriate department and dean.

(1) All students must earn credit in a sequence of basic composition courses, (e.g., English 104 and 105), normally in the freshman year.

(2) Continued development of communication skills following the freshman year is the responsibility of the student's major department. This development may be promoted by requiring and critically evaluating term papers and other written assignments as part of courses offered by the department and by encouraging students to enroll in advanced English composition courses which meet their particular needs.

(3) Each department is responsible for certifying that its majors have achieved an adequate level of proficiency in written communication at the time of graduation.

English Requirement for International Students

International students whose first language is not English must demonstrate ability to study in this English-speaking university. Such students—beginning as well as those who transfer from other institutions—must take English placement test when they arrive on campus. The test is administered by the English Department and is offered at the opening of each semester.

Students whose performance on this placement examination is satisfactory will follow the regular English requirements of their major department. Students who have deficiencies will enroll in special English classes (as determined by the test results).

International students transferring from other U.S. colleges or universities who offer transfer credits for English 104-105 must also meet the above requirements before such credits can be applied.

Library Study

Independent study and investigation through the use of books and libraries enable students to grow intellectually and professionally in college and afterward. For this reason, all students receive instruction in the use of the University Library, including practice in how to locate the published literature of their respective fields of study.

Curriculum Requirements

The curriculum requirements both in number of credit hours and specific courses are guidelines for the student and his or her adviser in planning a college program. The curriculum is subject to change and because of these changes, adjustments may need to be made.

Catalog in Effect

A student may choose to graduate under the catalog in effect at the time of graduation, or one of the two immediately preceding catalogs. Students are given a period of time to choose the catalog. The student may request to change and because of these changes, adjustments may need to be made.

Special Recognitions

The Dean’s List, issued in spring for students enrolled the fall semester and in summer for students enrolled the spring semester, recognizes undergraduate students who have been enrolled for 15 or more hours (excluding "P" and "I" marks) during the semester and have earned a quality-point average of 3.50 or higher.

High scholarship is recognized at graduation. Undergraduate students who have a cumulative quality-point average of 3.50 or above are eligible to graduate with distinction. The quality-point average upon which graduation with distinction is determined includes all work undertaken at Iowa State prior to the opening of the term in which the student receives his or her degree.

Each spring the University recognizes high scholarship students at the annual Scholarship Recognition Dinners. Those students who rank in the top 2 percent of each class in all colleges and the senior who is graduating "with distinction" and has attained the highest grade-point average in her or his curriculum or major are honored. Special recognition is also given to the graduating senior in each college with the highest average.

Many special awards, established by professional groups, alumni, and others interested in the University, are presented annually in recognition of academic attainment and noteworthy achievements in other areas of campus life. Information about awards offered in the various colleges is available through the offices of the respective deans.

Special Programs

Honors Program

The Iowa State University Honors Program is designed for students who have demonstrated the ability and maturity to assume more than the usual responsibility for their undergraduate education. Students in the Honors Program determine their educational objectives and devise an individualized program of study to meet these objectives. An Honors program may include substitutions for required courses, combinations of courses from several departments to form a new major or minor, Honors courses and seminars, independent study and research, and other forms of innovation. The goal is to enable Honors students to gain maximal benefit from their undergraduate education.

Each undergraduate college operates its own Honors Program. The college committees admit students into the program, approve programs of study, and are responsible for administration of their college Honors Program. The University Honors Program Committee, which includes the chairpersons of each college program, is responsible for the general coordination of the University Honors Program.

Special educational opportunities. Honors courses, open only to Honors Program students, and Honors sections of regular courses are offered by various departments. These courses have limited enrollment and are taught by specially selected instructors. An Honors student may also have any course designated as an Honors course by making appropriate arrangements with the course instructor.

The University Honors Program offers special seminars which are open only to Honors Program students. These seminars, which have limited enrollments and are offered on a satisfactory-fail basis, are listed under Undergraduate Studies 321 and 322.
A listing of Honors courses and seminars for the current academic year may be obtained from the Honors Program office.

Most departments offer opportunities for independent study and research under 290 or 490. When suitable, these courses carry Honors credit. Research grants are available to support Honors research.

Eligibility. Students become eligible to apply for admission to the Honors Program during their second semester in residence and continue to be eligible for admission as long as they have at least 48 semester credits remaining before graduation. Admission is based on the student's grade-point average and other evidence of exceptional ability and potential. Decisions with respect to admission are made by the college Honors Program committees.

Freshman Honors Program. Entering freshmen with outstanding high school records and academic ability may be eligible to participate in the Freshman Honors Program. The Freshman Honors Program, which is designed to introduce students to an Honors education, consists of special Honors sections of English 105 and other freshman courses, a Freshman Honors Seminar, and advising by specially selected Honors advisers. Admission is limited and by invitation and is based on past academic achievement, potential, and interest in an Honors education.

Further information. Further information concerning the University Honors Program and the Freshman Honors Program can be obtained from the Honors Program Office in Osborn Cottage.

Seminar Eighties

The Seminar Eighties program is designed to promote the analysis and discussion of current issues. Supervised by a faculty-student advisory committee, seminars are offered each semester under University Studies 311 and 312. Each seminar meets once a week, and students are awarded one hour of academic credit for participation. Leaders include ISU faculty, staff, students, and members of the Ames community. A brochure with current information is published each semester prior to precategorization and can be obtained from the Special Programs office in Osborn Cottage.

Inter-Institutional Programs

Students have the opportunity to complete two years of study at another institution and the last two years at Iowa State through coordinated programs offered by the College of Home Economics.

Dual-Degree Programs

Students who complete the first three years in certain curricula at Iowa State and who satisfactorily complete the first year in a recognized medical, dental, veterinary medical, or law curriculum may then be awarded the baccalaureate degree from Iowa State. (See Index, Preprofessional programs.)

Iowa Lakeside Laboratory

The Iowa Lakeside Laboratory at Lake Okoboji is a cooperative program in teaching and research in the biological sciences, sponsored jointly by Iowa State University, the University of Iowa, and the University of Northern Iowa. The Laboratory offers course work during two terms of five weeks each in June, July, and August.

Gulf Coast Research Laboratory

Through its affiliation with the Gulf Coast Research Laboratory at Ocean Springs, Mississippi, Iowa State offers its students the opportunity to enroll in courses or to do research in a marine environment by enrolling at Iowa State and paying Iowa State tuition. Courses available to Iowa State students during the two summer terms at the laboratory are listed under the course descriptions of the departments of Botany, Microbiology, and Zoology.

Summer Study Abroad Language Programs

The Regents universities of the State of Iowa cooperate each summer in European study programs of French, German, and Spanish language. These programs of about eight-weeks duration are located in France, Austria, and Spain. They offer the student an opportunity to earn 6-12 credits toward graduation, and to participate in an extraordinarily rich cultural experience. The minimum requirement for enrollment in the programs is two years of university-level study of the appropriate language. Further information about requirements and specific courses offered can be obtained from the Department of Foreign Languages and Literatures.

Study Abroad

A number of Iowa State programs offer students the opportunity to study in foreign countries. Although the primary objectives of the specific programs may vary, all provide sound cultural and academic experiences. In some instances the emphasis will be on language study, and in others it will be on other specific disciplines. Most programs entail group studies, but individual students may arrange special summer programs involving independent study.

Arrangements for foreign study abroad should be made at an early date. If university credit is desired from study at a foreign institution, the Admissions Office should be contacted well in advance to confirm that credit will be approved here. The Office of International Educational Services coordinates many of these activities and is available to advise interested persons.

Arrangements for foreign study can also be made through the SPAN program and the International Studies option (see index).

Military Training

Iowa State students may elect to participate in one of the Reserve Officers Training Programs (ROTC) offered at Iowa State by the Army, the Navy, and the Air Force. Descriptions of the specific programs are found under the departments of Air Force, Aerospace Studies, Military Science, and Naval Science. A student who completes a four-year program in any of these fields may be commissioned as a military officer at the time of graduation.

Late Afternoon, Evening, and Saturday Classes

In order to make on-campus courses available to those who live within commuting distance of Ames, classes are scheduled in the late afternoon and evening so that persons with full-time employment or other responsibilities may commute and continue their education. As many as 25 departments have offered courses in this manner, and the university publishes a brochure announcing these courses each semester. This publication may be obtained by writing or calling the Office of Admissions and Records, 109 Beardshear Hall, Iowa State University, Ames, Iowa 50011 Information regarding any of these programs may also be obtained by contacting the Office of Admissions and Records.

Off-Campus Credit Courses and Programs

As a land-grant institution Iowa State has shared the conviction that, regardless of location, as many lowans as possible should have access to the ideas and knowledge available to on-campus students. A number of credit courses and programs are available which present educational opportunities at off-campus locations or via non-traditional delivery means.

The courses are the same as those offered on campus and are taught by regular faculty members. Since the courses are considered resident courses, credit earned in them becomes a part of the student's academic record at Iowa State. It is possible to meet degree requirements in the same manner as course credit earned on campus.

Each college of the University endeavors to identify the needs of lowans and to provide suitable credit courses and programs to meet these needs. Some courses or programs are not suitable for off-campus delivery due to the non-availability of certain learning resources such as libraries or laboratories, or due to non-availability of faculty.

Persons interested in currently available courses and their locations, or requesting courses and programs in specific subject matter and locations, should contact the Office of Continuing Education, Iowa State University, or one of the twelve ISU Area Extension offices located in Cedar Rapids, Council Bluffs, Creston, Davenport, Des Moines, Dubuque, Fort Dodge, Mason City, Ottumwa, Sioux City, Spencer and Waterloo.

Many off-campus credit courses are offered because of a special interest or need by a particular group and are not, therefore, part of any special program. However, in some locations a series of courses may be offered to fulfill certain academic or educational objectives.

Some of the programs offered are listed below:

Master of Agriculture

The major in professional agriculture is an off-campus program leading to the degree Master of Agriculture. It is available to students who wish to pursue graduate study in agriculture with a minimum of course work on campus. The program is considered to be a terminal master's degree. Those who major in professional agriculture are required to take a minimum of two courses in each of three disciplines and complete 24 semester credits of formal course work. Courses are offered in Agricultural Mechanization, Agronomy, Animal Science and Economics.

A minimum of four credits of creative component experience is required. A thesis option is not available. The creative component is a demonstration of independent creativity with a written report of laboratory, field or library research acceptable to the student. The program consists of study committees. Each of these committees must be approved by the student's program committee in advance. The student then must submit a written report of his work to the committee for approval.
analytical tools, policy analysis, organizational dynamics and management, and the political-social-economic basis of public service.

Course work is offered in late afternoons and evenings or at specially arranged times to allow individuals with full-time occupations to attend classes. Generally, the degree takes two years to complete, depending upon the time and abilities of the students.

Bachelor of Liberal Studies

Through the College of Sciences and Humanities, the University offers the Bachelor of Liberal Studies (BLS) degree to students whose personal commitments prevent full-time, on-campus study. The BLS degree is offered with similar requirements by all three Regent universities, and provides a framework for off-campus study to assemble all of the educational opportunities they may have locally available into a coherent four-year educational program. The Regent universities and other four-year colleges support the third and fourth years of study; formal admission to the BLS program is granted only after students have completed an Associate in Arts or Associate in Science degree from an accredited two-year college or have completed at least 62 semester credits acceptable toward graduation at the chosen Regent university with a grade-point average of at least 2.00. Inquiries concerning the program at Iowa State should be directed to the Associate Dean for Academic Programs of the College of Sciences and Humanities.

Television and Radio Courses Program

Broadcast radio or television lessons offer college credit to persons all over Iowa through this home study program. In addition to the radio or television segments each course contains textbooks, written assignments, exams, and a study guide packet. Instructor contact is handled by phone or mail. Exams are taken at one of the 19 Learning Centers throughout the state. Courses change from term to term with approximately half of the offerings coming from the liberal arts area and the remainder from professional studies. Television and radio segments are developed by a variety of institutions in the U.S. with Iowa State University adapting and summarizing each course to meet its university requirements. These courses are considered to be resident Iowa State University courses and may be used to meet degree requirements in the same manner as courses taken on campus.

Admission

Undergraduate and Special Students. A high school graduate may enroll in off-campus undergraduate courses as a special student. However, after the accumulation of a number of college credits, a formal application for admission as a regular undergraduate student should be accomplished and an adviser obtained. (See Admission of New Undergraduate Students.)

Graduate Students. A graduate of a regionally accredited college or university in the United States, if admitted to the Graduate College, may enroll occasionally in off-campus graduate courses as a nondegree graduate student. However, only 9 semester hours of graduate credit earned under the nondegree option may be applied if the student later chooses to enter a degree program. Transfer from nondegree status to full graduate admission requires the procedures specified by the Graduate College. (See Graduate College Admissions.)

Enrollment

Enrollment in off-campus courses can be accomplished by contacting any of the area extension offices, the Office of Continuing Education at Iowa State University, or the State Board of Regents Center in Atlantic, in one of three ways: by phone, in person, or by mail.

Advance enrollment is strongly encouraged and enhances the probability of a given course being offered. Registration dates for each semester are announced in published schedules.

Off-Campus Fees. Students taking off-campus courses pay fees as stated in the Hourly Fee Schedule, except for certain cases. For both the Hourly Fee Schedule and exceptions see page 11.

Withdrawal and Refund. A student who wishes to withdraw from a course must first notify the instructor, and then the Office of Continuing Education (in writing). 102 Scheman, Iowa State University, Ames, Iowa 50011. A 100 percent refund will be made if a student withdraws by the end of the second class period. No refund will be made for withdrawal after the second class period.

Minimum Enrollment. A minimum enrollment is required to permit the offering of an off-campus class.

Services

Activity Fee. Off-campus students may pay an activity fee in addition to course fees, each semester, which qualifies them and their spouses for student admission rates to concerts, lectures, and athletic events. Students wanting to pay the activity fee should indicate at registration.

Library. Off-campus students in good standing (fees paid) may use the ISU Library. The ISU Library has access to records of all students enrolled.

Identification Cards. These may be provided to fully admitted students upon request to the Office of the Registrar.

Student Counseling Service. Services are available to off-campus students at the Student Counseling Service.

Veteran Benefits. The Office of the Registrar will provide advice as to proper procedure for application and certification for veteran's benefits.
# Academic Regulations

The academic regulations of the University are published annually in the ISU Information Handbook. Each student is provided with a copy of the handbook at initial registration and is expected to know and to follow the policies and procedures outlined therein.

## Grading System
Grades are reported on a 4.00 scale, with the quality points per credit hour assigned as follows:

- A: 4 points
- B: 3 points
- C: 2 points
- D: 1 point
- F: 0 points
- NP: 0 points

The student's quality-point average, based on the quality points obtained for each course, divided by the total number of credits for which BME Biomedical Engineering Phil Philosophy is published annually.

### Academic Designators

- Acct: Accounting
- A E: Agricultural Engineering
- A Ed: Animal Ecology
- A Ed: Adult Education
- Aer E: Aerospace Engineering
- AFAS: Air Force Aerospace Studies
- Ag Ed: Agricultural Education
- Ag M: Agricultural Mechanization
- Ag St: Agricultural Studies
- Agron: Agronomy
- Am In: American Indian Studies
- An S: Animal Science
- Anthr: Anthropology
- Arch: Architecture
- Art: Art and Design
- Astro: Astronomy and Astrophysics
- Ath: Athletics
- B: B Biochemistry and Biophysics
- B M: Biomedical Engineering
- Biol: Biology
- Bot: Botany
- BusAd: Business Administration
- C D: Child Development
- C E: Civil Engineering
- C Grk: Classical Greek
- Ch E: Chemical Engineering
- Chem: Chemistry
- Cl St: Classical Studies
- Co Ed: Counselor Education
- Com S: Computer Science
- Con E: Construction Engineering
- Crp E: Computer Engineering
- C R P: Community and Regional Planning
- Curr: Curriculum and Instructional Media
- Dance: Dance
- Dsr S: Design Studies
- E E: Electrical Engineering
- E M: Engineering Mechanics
- E Op: Engineering Operations
- E Sc: Engineering Science
- Ea Sc: Earth Science
- Econ: Economics
- EdAcad: Educational Administration
- El Ed: Elementary Education
- Engl: English
- Ent: Entomology
- Env: Environmental Studies
- F: Family Environment
- Fin: Finance
- F Lng: Foreign Languages and Literatures
- F N: Food and Nutrition
- F Tch: Food Technology
- For: Forestry
- Fr: Freshman Engineering
- Frmch: French
- G P S: Goodes, Photogrammetry, and Surveying
- Gen: Genetics
- Geog: Geography
- Geol: Geology
- Ger: German
- Gr St: General Graduate Studies
- H Ed: Home Economics Education
- HE St: Home Economics Studies
- H P C: Historical, Philosophical, and Comparative Studies in Education
- H S: Health Studies
- Hg Ed: Higher Education
- Hist: History
- Hort: Horticulture
- Hou: Housing
- I A S: Industrial Administrative Sciences
- I E: Industrial Engineering
- I Ed: Industrial Education
- I Mgt: Institution Management
- I R: Industrial Relations
- Imbio: Immunobiology
- Ital: Italian
- IVTE: Industrial Vocational Technical Education
- J M C: Journalism and Mass Communication
- L A: Landscape Architecture
- L S: Leisure Studies
- Latin: Latin
- Lib: Library
- M E: Mechanical Engineering
- M S: Military Science
- M S E: Materials Science and Engineering
- Math: Mathematics
- MCDB: Molecular, Cellular and Developmental Biology
- Mgmt: Management
- Micro: Microbiology
- Mk: Marketing
- Meteor: Meteorology
- Music: Music
- N S: Naval Science
- Nuc E: Nuclear Engineering
- P E: Physical Education
- P M: Pest Management
- Phil: Philosophy
- Phys: Physics
- Pol: Political Science
- Port: Portuguese
- PP SW: Plant Pathology, Seed and Weed Sciences
- ProAg: Professional Agriculture
- Pr St: Professional Studies in Education
- Psych: Psychology
- Relig: Religious Studies
- ResEv: Research and Evaluation
- Rus: Russian
- SafEd: Safety and Driver Education
- S H: Sciences and Humanities
- SecEd: Secondary Education
- Soc: Sociology
- Sp: Speech
- Spain: Spanish
- Stat: Statistics
- T C: Textiles and Clothing
- Tr Log: Transportation/Logistics
- Tr Fi: Transportation Planning
- T SC: Technology and Social Change
- U S: University Studies
- V: Veterinary
- V A N: Veterinary Anatomy
- V C S: Veterinary Clinical Sciences
- V Med: Veterinary Medicine
- V MP M: Veterinary Microbiology and Preventive Medicine
- V P P: Veterinary Physiology and Pharmacology
- V P h: Veterinary Pathology
- W Res: Water Resources
- W S: Women's Studies
- Zool: Zoology

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![Image](image-url)
analytical tools, policy analysis, organizational dynamics and management, and the political-social-economic basis of public service.

Course work is offered in late afternoons and evenings or at specially arranged times to allow individuals with full-time occupations to attend classes. Generally, the degree takes two years to complete, depending upon the time and abilities of the students.

**Bachelor of Liberal Studies**

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**Admission**

**Undergraduate and Special Students.** A high school graduate may enroll in off-campus undergraduate courses as a special student. However, after the accumulation of a number of college credits, a formal application for admission as a regular undergraduate student should be accomplished and an adviser obtained. (See Admission of New Undergraduate Students.)

**Graduate Students.** A graduate of a regionally accredited college or university in the United States, if admitted to the Graduate College, may enroll occasionally in off-campus graduate courses as a non-degree graduate student. However, only 9 semester hours of graduate credit earned under the nondegree option may be applied if the student later chooses to enter a degree program. Transfer from nondegree status to full graduate admission requires the procedures specified by the Graduate College. (See Graduate College Admissions.)
The academic regulations of the University are published annually in the ISU Information Handbook. Each student is provided with a copy of the handbook at initial registration and is expected to know and to follow the policies and procedures outlined therein.

Grading System
Grades are reported on a 4.00 scale, with quality points per credit hour assigned as follows:

- A: 4 points
- B+: 3.3 points
- B: 3 points
- B-: 2.7 points
- C+: 2.3 points
- C: 2 points
- C-: 1.7 points
- D+: 1.3 points
- D: 1 point
- D-: 0.7 points
- F: 0 points

The student's quality-point average, based on the quality points obtained for each course divided by the total number of credits for which the student has registered, is calculated for each semester as well as on a cumulative basis. This information is included in the grade report supplied to the student at the end of each semester.

A few courses are graded on a satisfactory-fail basis only, a grade of S (satisfactory) carries credit toward graduation but is not included in calculation of the quality-point average.

Students who have completed 45 credits may elect to repeat a limited number of courses under a Pass-Not Pass option, in which a grade of D or better is recorded as Pass (P) and a grade of F is recorded as Not Pass (NP). Neither P nor NP are included in calculation of the quality-point average. This privilege provides an opportunity for a student to overcome the effects of a poor academic term.

Satisfactory Academic Progress
Minimum satisfactory scholastic achievement is represented by a 2.00 quality-point average each semester of enrollment. Students who fall below this level may be placed on temporary enrollment for a semester; if they fail to meet the required standard of performance, they may then be dismissed from the University. Decisions concerning placement on temporary enrollment and dismissal are made by the college academic standards committees in accordance with guidelines established by the University Academic Standards Committee.

Class Attendance
Students are expected to attend class meetings as scheduled. Each instructor sets his or her own policy with respect to class attendance, and excuses for absence from class are handled between the student and the instructor.
College of Agriculture

Lee Kolmer, Dean
Louis M. Thompson, Associate Dean

Departments of the College

Agricultural Education
Agricultural Economics
Agricultural Engineering
Agricultural Studies
Agronomy
Animal Ecology
Animal Science
Biochemistry and Biophysics
Entomology
Food Technology
Forestry
Genetics
Horticulture
Journalism and Mass Communication
Plant Pathology, Seed and Weed Sciences
Sociology

Students enrolled in the College of Agriculture are provided a broad-based education which includes course work in communications; humanities; and biological, physical, and social sciences; and technical subject matter. Opportunities, because of the well balanced curriculum in the College of Agriculture, lead to a Bachelor of Science degree. Each curriculum, has specific degree requirements for graduation, which include the group requirements for the College of Agriculture core curriculum.

Core Curriculum
With the exception of the winter program and 2-year certificate program in farm operation, all curricula in the College of Agriculture lead to a Bachelor of Science degree. Students with deficiencies in the above areas may be required to take courses that will not count toward graduation requirements.

Cr. Group Requirements
9 I. Communications
   (Selected courses in English, journalism, and speech that improve written or spoken communication skills, plus library)
13 II. Mathematical and physical sciences
   (Courses covering topics in biochemistry, chemistry, computer science, geology, mathematics, meteorology, and statistics that provide a basic understanding of plants and animals.
6 III. Biological sciences
   (Selected courses in animal ecology, biochemistry, biology, botany, entomology, genetics, microbiology, and zoology that provide a basic understanding of plants and animals)
6 IV. Social sciences
   (Courses covering topics in economics, political science, psychology, and sociology that provide an understanding in human behavior)
6 V. Humanities
   (Courses selected from art, history, literature, music, or philosophy to increase cultural awareness)
Curriculum in Agricultural Biochemistry

Administered by the Department of Biochemistry and Biophysics

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Degree Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5</td>
<td>Communications</td>
</tr>
<tr>
<td></td>
<td>Engl 104, 105; Lib 160; Sp 211 or Engl 414</td>
</tr>
<tr>
<td>11-12</td>
<td>Mathematical sciences</td>
</tr>
<tr>
<td></td>
<td>Math 165, 166, Stat 101 or 104</td>
</tr>
<tr>
<td>37</td>
<td>Physical sciences</td>
</tr>
<tr>
<td></td>
<td>Chem 177, 177L, 178, 211, 321, 321L, 322, 331, 322L, 333, 333A, Phys 221, 222</td>
</tr>
<tr>
<td>13-15</td>
<td>Biological sciences</td>
</tr>
<tr>
<td></td>
<td>Biol 110, 110L, 312; Zool 206 and 206L or Bot 207; Gen 330 or 320</td>
</tr>
<tr>
<td>6</td>
<td>Social sciences</td>
</tr>
<tr>
<td>6</td>
<td>Humanities</td>
</tr>
<tr>
<td>9</td>
<td>Agricultural sciences</td>
</tr>
<tr>
<td></td>
<td>Complete three of the following four options: Agron 114 or Hort 221, Agron 154, AnS 114, F Tech 101</td>
</tr>
<tr>
<td>13-15</td>
<td>Agricultural Biochemistry</td>
</tr>
<tr>
<td></td>
<td>BB 101, 102, 201, 404, 405 (or 501, 502), 411 Students wishing research experience in agricultural biochemistry are encouraged to enroll in BB 499</td>
</tr>
<tr>
<td>10</td>
<td>Supportive electives*</td>
</tr>
<tr>
<td>8.5-18.5</td>
<td>Electives</td>
</tr>
<tr>
<td>128</td>
<td>Total Credits</td>
</tr>
</tbody>
</table>

*These courses, to be selected from an approved list available in the departmental office, shall include two related courses in agricultural sciences.

Typical Program for the First Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>General Chemistry — Chem 177</td>
</tr>
<tr>
<td>1</td>
<td>Laboratory in General Chemistry — Chem 177L</td>
</tr>
<tr>
<td>4</td>
<td>Calculus I — Math 165</td>
</tr>
<tr>
<td>3</td>
<td>Freshman Composition — Engl 105</td>
</tr>
<tr>
<td>1</td>
<td>Laboratory in General Biology — Biol 110L</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to Biochemical Activities — BB 101</td>
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</tbody>
</table>

<table>
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<th>Cr.</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>General Chemistry — Chem 178</td>
</tr>
<tr>
<td>4</td>
<td>Quantitative Analysis — Chem 211</td>
</tr>
<tr>
<td>4</td>
<td>Calculus II — Math 166</td>
</tr>
<tr>
<td>3</td>
<td>Freshman Composition — Engl 105</td>
</tr>
<tr>
<td>1</td>
<td>Laboratory in General Biology — Biol 110L</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to Biochemistry — BB 102</td>
</tr>
</tbody>
</table>

Curriculum in Agricultural Business

Administered by the Department of Economics. Students are required to select one area of specialization from the following: economic analysis, public policy, farm management, agricultural business management, agricultural finance, agricultural sales and marketing.

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Degree Requirements</th>
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<tr>
<td>9.5</td>
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</tr>
<tr>
<td>12.5</td>
<td>Communications</td>
</tr>
<tr>
<td></td>
<td>Engl 104, 105, 414; Sp 211; Lib 160</td>
</tr>
<tr>
<td>13</td>
<td>Mathematical sciences</td>
</tr>
<tr>
<td></td>
<td>Math 150, 151; Stat 227, 228</td>
</tr>
<tr>
<td>5</td>
<td>Physical sciences</td>
</tr>
<tr>
<td></td>
<td>Chem 163, 163L</td>
</tr>
<tr>
<td>6</td>
<td>Biological sciences</td>
</tr>
<tr>
<td></td>
<td>Biol 109; electives (3 cr.)</td>
</tr>
</tbody>
</table>

Typical Program for the First Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>General Chemistry — Chem 177</td>
</tr>
<tr>
<td>1</td>
<td>Laboratory in General Chemistry — Chem 177L</td>
</tr>
<tr>
<td>4</td>
<td>Calculus I — Math 165</td>
</tr>
<tr>
<td>3</td>
<td>Freshman Composition — Engl 105</td>
</tr>
<tr>
<td>1</td>
<td>Laboratory in General Biology — Biol 110L</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to Biochemical Activities — BB 101</td>
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<table>
<thead>
<tr>
<th>Cr.</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>General Chemistry — Chem 178</td>
</tr>
<tr>
<td>4</td>
<td>Quantitative Analysis — Chem 211</td>
</tr>
<tr>
<td>4</td>
<td>Calculus II — Math 166</td>
</tr>
<tr>
<td>3</td>
<td>Freshman Composition — Engl 105</td>
</tr>
<tr>
<td>1</td>
<td>Laboratory in General Biology — Biol 110L</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to Biochemistry — BB 102</td>
</tr>
</tbody>
</table>

Curriculum in Agricultural Education

Students in agricultural education may pursue a diversified or specialized program to prepare for teaching vocational agriculture. For certification in an area of agricultural specialization, a total of 48 credits is required, with at least 20 credits in one area, 10 credits in a second area, and 12 credits in remaining required agriculture courses and agriculture electives. Described below is the diversified approach to certification for teaching vocational agriculture.

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Degree Requirements</th>
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<tbody>
<tr>
<td>9.5</td>
<td>Communications</td>
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<tr>
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<td>Engl 104, 105; Lib 160; Sp 211</td>
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<tr>
<td>12.5</td>
<td>Communications</td>
</tr>
<tr>
<td></td>
<td>Engl 104, 105, 414; Sp 211; Lib 160</td>
</tr>
<tr>
<td>13</td>
<td>Mathematical sciences</td>
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<tr>
<td></td>
<td>Math 150, 151; Stat 227, 228</td>
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<tr>
<td>5</td>
<td>Physical sciences</td>
</tr>
<tr>
<td></td>
<td>Chem 163, 163L</td>
</tr>
<tr>
<td>6</td>
<td>Biological sciences</td>
</tr>
<tr>
<td></td>
<td>Biol 109; electives (3 cr.)</td>
</tr>
</tbody>
</table>

Preprofessional Studies

Agricultural business provides preparation for studies in law.

Curriculum in Agricultural Biochemistry

Administered by the Department of Biochemistry and Biophysics. The student is encouraged to select a primary major department or to complete a summer orientation program in which they will have the opportunity to meet and work with academic advisers in planning their first semester schedule of classes. The advisers also assist students in making personal adjustments to university life, and provide helpful information on vocational choices. A special effort is made by the advisers in the College of Agriculture to adjust the schedule of course work in accordance with students' interests and capabilities.

Graduate Study

Graduate study in agriculture is conducted through the Graduate College. Details are found in the Graduate College section of this catalog. Various departments in the College of Agriculture also participate in the following graduate-level interdepartmental offerings: Immunobiology, Molecular, Cellular and Developmental Biology, Professional Agriculture, Technology and Social Change (interdepartmental minor), Water Resources (interdepartmental major). For details, consult the Graduate College section of this catalog.

Program in Pre-veterinary Medicine

One may enroll as a pre-veterinary medicine student in the College of Agriculture until the primary major is selected for a degree program. The student is encouraged to select a primary major as soon as possible. Once the primary major is selected, the student's adviser will be in the primary major department. The pre-veterinary medicine program may be completed along with any curriculum in the College of Agriculture, but the time required will depend on the curriculum selected.

For requirements for admission to the College of Veterinary Medicine see page 67.

Program in General Agriculture

General agriculture is a nondegree program for students with an undecided major in the College of Agriculture.
Curriculum in Agricultural Education

Administered by the Department of Agricultural Education. Agricultural education education may be taken only as a secondary major in a double major program. The primary major must be a curriculum in the College of Agriculture.

Cr. Degree Requirements

17.5 Communications
Engl 104, 105, 302; JI MC 225; Sp 211, 312; Lib 160

13 Mathematical and physical sciences
Chm 163, 163L; B B 221; mathematics or statistics electives (3 cr.); electives (2 cr.)

6 Biological sciences
Biol 105; electives (3 cr.)

12 Social sciences
Soc 130 or 134, 264, two or more of the following: Soc 310, 382, 415, 464, 473, 485

6 Humanities
Electives from approved list

20 Professional courses
Ag Ed 214, 314, 414; Ad Ed 469; electives (5 cr.)

53.5 Primary major requirements and free electives

128 Total credits

Typical Program for the First Year

Because agricultural extension education is a secondary major that has requirements that are similar in several respects to those of the agricultural education major, courses taken by the student during the first year will be similar to those taken by first-year agricultural education majors. Differences in individual programs will reflect the student’s choice of primary major.

Curriculum in Agricultural Journalism

Administered by the Department of Journalism and Mass Communication.

Cr. Degree Requirements

12.5 Communications
Engl 104, 105; Sp 211; Lib 160; elective (3 cr.) of written or spoken English

6 Mathematical sciences
Mathematics, statistics or computer science

11 Physical sciences
Select from courses in chemistry, physics, geology, meteorology, or metallurgy. (Course requirements in this area depend on the student’s area of concentration in agriculture. See your adviser.)

7 Biological sciences
Biol 105 or 110; elective (4 cr.)

10 Social sciences
Econ 201; Pol S 215, elective (3 cr.) in one other area of social sciences

9 Humanities
Hist 365 or 366, electives (6 cr.) in art, history, literature, music, or philosophy

24 Agricultural sciences
Course requirements in this area depend on area of concentration. See your adviser for required course list

30-32* Journalism and Mass Communication

10 JI MC 101, 201, 202, 203

9-10 JI MC 300-level skills courses (must include one from 345, 352, 360, 361, 370)

6 JI MC 430, 491, 499

5-6 JI MC 400-level advanced courses (must include one from 410, 431, 462)

16.5-18.5 Free electives

128 Total credits

Typical Program for the First Year

Cr. Fall

3 Freshman Composition — Engl 104

3-4 Mathematics elective

3 Introductory Biology — Biol 109

0.5 Library Instruction — Lib 160

4 Principles of Economics — Econ 201

3 American Government — Pol S 215

Spring

3 Freshman Composition — Engl 105

3 Physical science elective

3 Principles of Crop Production — Agron 114

Curriculum in Agricultural Mechanization

Administered by the Department of Agricultural Engineering.

Cr. Degree Requirements

9.5 Communications
Engl 104, 105; Sp 211, Lib 160

10-12 Mathematical sciences
Math 165 or both 140 and 142; Stat 104; Corn S 175

12-13 Physical sciences
Chem 163, 163L; BB 221 or both Chem 231 and 232A; Phys 111

6 Biological sciences
Biol 103; electives (3 cr.)

7 Social sciences
Econ 201, Pol S 215

6 Humanities

17 Agricultural sciences
An S 114, 218; Agron 154, 212; Econ 330

32 Agricultural mechanization
Ag M 110, 191, 250, 255, 324, 326, 330, 335, 360, 362, 435, 473, electives (3 cr.)

12-14 Other required courses
I Ed 120; Acct 284; Mid 340 or Econ 335; Mgmt 315 or Econ 451

11.5-16.5 Electives

128 Total credits

Typical Program for the First Year

Cr. Fall

2 Principles of Mechanization in Agriculture — Ag M 191

R Orientation in Agricultural Mechanization — Ag M 310

3 Introductory Biology — Biol 109

3 Freshman Composition — Engl 104

5 General Chemistry — Chem 163, 163L

3 Introduction to Statistics — Stat 104

Spring

3 Agricultural Construction Materials and Procedures — Ag M 250

3 Freshman Composition — Engl 105

3 Survey of the Animal Industry — An S 114

3 Introduction to Graphic Communications — I Ed 120

3 Fundamentals of Soil Science — Agron 134

0.5 Library Instruction — Lib 160
Curriculum in Agronomy

Students majoring in agronomy study crop science, soil science and agricultural climatology. Areas of specialization may be selected upon consultation with academic advisers.

Cr. Degree Requirements
14-15.5 Communications
Engl 104, 105; Lib 160; Sp 211, select at least two additional courses from Engl 302, 414, Jl MC 225, and Sp 312.
6 Mathematical sciences
Math (3 cr.); Stat 104
16 Physical sciences
Chem 163, 163L, 231, 232A, Geol 100; Phys 106 or 111
15-16 Biological sciences
Biol 110; Bot 207, 310; select at least two additional courses from Micro 300; Gen 320 and An S 318
6 Social sciences
Econ 201, one course in Psych or Soc
6 Humanities*
32 Agronomic sciences
Ag 104, Agron 110, 114, 154, 206, 311, 318, 354, 411, electives (16 credits of which 9 must be taken at the 400 level) No more than 2 credits total from Agron 331X, 371, 400 and 490 will be allowed to meet the 16 credit requirement.
30.5-32.5 Free electives
128 Total Credits

*The approved list of courses to satisfy the humanities requirement may be obtained from the agronomy adviser.

Typical Program for the First Year

Cr. Fall
1 Principles of Biology — Biol 110, 110L
2 Orientation in Animal Ecology — A Ecl 110
3 General Chemistry — Chem 163, 163L or 177, 177L
4 Freshman Composition — Engl 104
5 Fundamentals of Algebra for Science and Higher Mathematics — Math 140

Spring
3 Wildlife Resource Conservation — A Ecl 231
3 General Chemistry — Chem 164
3 Freshman Composition — Engl 105
3 Trigonometry — Math 141
5 General Zoology — Zool 206, 206L
0.5 Library Instruction — Lib 160

Preventerity Studies
Preparation for admission to veterinary medicine may be accomplished through the animal ecology curriculum.

Curriculum in Animal Ecology

Areas of specialization may be selected upon consultation with academic adviser.

Cr. Degree Requirements
11.5-12.5 Communications
Engl 104, 105, 204; Lib 160, one

Curriculum in Animal Science

Cr. Degree Requirements
12.5 Communications
Engl 104, 105, 204; Lib 160; Sp 211
6 Mathematical sciences
Math 150; Stat (3 cr.)
8 Physical sciences
Chem 171, 171L; BB 221 or organic chemistry (3 cr.)
12 Biological sciences
Biol 110, 110L; genetics (3 cr.) or microbiology (4 cr.); Zool 155 and 160 or 206 and 206L
10 Social sciences
Econ 201; electives (6 cr.)
6 Humanities
34 Animal science
An S 110, 114, 210, 214, 318, 319, 331, 352, 360, 370, 9 credits — 3 courses from different commodity areas at the 400 level
6 Agricultural sciences
Agron 114, 154
33.5 Free electives
128 Total credits

Typical Program for the First Year

Cr. Fall
1 Orientation in Animal Science — An S 110
3 Survey of the Animal Industry — An S 114
3 Principles of Biology — Biol 110
1 Laboratory in General Biology — Biol 110L
3 Freshman Composition — Engl 104
0.5 Library Instruction — Lib 160
3 Mathematics — Math 150
3 Elective

Spring
3 Principles of Crop Production — Agron 114
4 General Chemistry — Chem 177
1 Laboratory in General Chemistry — Chem 177L
3 Freshman Composition — Engl 105
3 Introduction to Statistics — Stat 104
3 Elective

Preventerity Studies
Preparation for admission to veterinary medicine may be accomplished through the animal science curriculum.

Curriculum in Biometry

Administered by the Department of Statistics. The major in biometry will take courses in statistics and mathematics, and with the guidance of an advisory committee from agriculture, will select technical agriculture courses which will provide some depth of training in an agriculturally related area.

Cr. Degree Requirements
9.5 Communications
Engl 104, 105, 211; Lib 160
14 Mathematical sciences
Math 165, 266, 268; Com S 172
Typical Program for the First Year

Cr. Fall
4 Calculus I — Math 165*  
3 Freshman Composition — Engl 104  
R Orientation in Statistics — Stat 100  
1 Laboratory in General Biology — Biol 110L
3 Principles of Crop Production — Agron 114  
3 Humanities elective

Spring
4 Calculus II — Math 166  
3 Freshman Composition — Engl 105  
3 Introduction to Statistics — Stat 104  
3 Principles of Crop Production — Agron 114
3 Humanities elective

*Math 140 if needed.

Curriculum in Dairy Science

Cr. Degree Requirements

12.5 Communications  
Engl 104, 105; Sp 211; Lib 160; electives (3)
6 Mathematical sciences  
Stat 104 (3); Math (3 cr.)  
8 Physical sciences  
Chem 177, 177L; BB 221 or Chem 331
12-13 Biological sciences  
Biol 110, 110L; Micro 300 (4 cr.) or F Tech 305 (3 cr.); Zool 155 and 156 or Zool 206 and 206L
7 Social sciences  
Econ 201; electives (3 cr.)
6 Humanities
34 Professional dairy science courses  
An S 110, 114, 210, 214, 318, 319, 331, 352, 434, 436; Acct 284; electives (6)
6 Agricultural sciences  
Agron 114, 154
35.5-36.5 Free electives
128 Total credits

Typical Program for the First Year

Cr. Fall
R Orientation in Dairy Science — An S 110  
3 Survey of the Animal Industry — An S 114  
3 Principles of Biology — Biol 110L  
1 Laboratory in General Biology — Biol 110L  
3 Freshman Composition — Engl 104  
0.5 Library Instruction — Lib 160  
3 Mathematics  
3 Elective

Spring
3 Principles of Crop Production — Agron 114  
4 General Chemistry — Chem 177  
1 Laboratory in General Chemistry — Chem 177L  
3 Freshman Composition — Engl 105  
3 Introduction to Statistics — Stat 104
3 Elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the entomology curriculum.

Curriculum in Entomology

Cr. Degree Requirements

12.5 Communications  
Engl 104, 105; Sp 211 or 204; Sp 211; Lib 160
6-7 Mathematical sciences  
Math 142; Com S 175 or Math 165 or Stat 104
26-30 Physical sciences  
Chem 177, 177L, 178, 178L, 231 and 232A or 331 and 332 and 333A and 333A; BB 201, 311; Phys 111, 112
25-26 Biological sciences  
Biol 110, 110L, 312; Micro 300; Gen 320 or 330; Bot 207; Zool 206, 206L
Zool 355 or Bot 310
7 Social sciences  
Econ 201; electives
9 Humanities  
electives
6 Agricultural sciences  
Agron 114 or An S 114; Agron 154
16 Entomology
Ent 110, 370, 376; Ent 490 or P M 491; Ent electives
14.5-20.5 Free electives
128 Total credits

Typical Program for the First Year

Cr. Fall
3 Freshman Composition — Engl 104  
3 Principles of Biology — Biol 110L  
1 Laboratory in General Biology — Biol 110L
4 General Chemistry — Chem 177  
1 Laboratory in General Chemistry — Chem 177L  
3 Principles of Crop Production — Agron 114 or Survey of the Animal Industry — An S 114
R Technical Lecture — Ent 110

Spring
3 Freshman Composition — Engl 105  
3 General Chemistry — Chem 178L  
1 Laboratory in General Chemistry — Chem 178L
3 General Zoology — Zool 206L  
2 General Zoology Laboratory — Zool 206L
0.5 Library Instruction — Lib 160
2-4 Elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the entomology curriculum.

Curriculum in Farm Operation

Administered by the College of Agriculture. The curriculum in farm operation includes a four-year program leading to the degree Bachelor of Science, a two-year program leading to a certificate in technical agriculture, and a collegiate-level winter program.

Cr. Degree Requirements (4-year degree)

12.5 Communications  
Engl 104, 105; Sp 211 or 311; Lib 160; electives (3 cr.)
6 Mathematical sciences  
Math (3 cr.); Stat 101 or 104 (3 cr.)
8 Physical sciences  
Chem 163, 163L; biochemistry or organic chemistry (3 cr.)
9 Biological sciences  
Biol 109 pr 110; electives (6 cr.)
7 Social sciences  
Econ 201; electives (3 cr.)
6 Humanities
46 Agricultural sciences  
Agron electives (6 cr.); Agron 114, 115, 212 (10 cr.); An S 114 or 214, 218 or 318, elected (3 cr.); (9 cr.)*; Econ 330 and 330-400 level Ag Econ or Ag 450 (7 cr.); credits 300-level or above to be chosen from agricultural education.

*Econ 101 or 201.
mechanization, agronomy, animal science, and agricultural economics (14 cr)
4 Other required courses
   Ag 110, 499; Acct 284
29.5 Free electives
128 Total credits
*Farm operation students choosing to develop an emphasis in animal production are advised to take An S 319 and 352 and the appropriate prerequisites. Those emphasizing agronomy, economics or agricultural mechanization may elect to take An S 218.

Typical Program for the First Year

Cr.  Fall
R Orientation in Farm Operation — Ag 110
3 Survey of the Animal Industry — An S 114
3 Agricultural mechanization elective
3 Freshman Composition — Engl 104
3 Social sciences elective
3 Biol 109

Spring
3 Principles of Crop Production — Agron 114
3 Agricultural mechanization elective
3 Biological science elective
3 Mathematical science elective
3 Freshman Composition — Engl 105
0.5 Library instruction — Lib 160

Preveterinary Studies
Preparation for admission to veterinary medicine may be accomplished through the farm operation curriculum.

Certificate Requirements: Winter Program**

Cr.  First Winter
1 Freshman Seminar I — Ag 102
2 Agricultural Maintenance Welding — Ag M 154
3 Animal Production — An S 101
2 Crop and Soil Fundamentals — Agron 142

Second Winter
1 Freshman Seminar II — Ag 103
2 Soil and Crop Management — Agron 144
3 Farm Business Practice — Econ 130

2 Machinery Systems and Power Management — Ag M 134
16 Total credits
**A 1.70 grade-point average is required to earn the certificate.

Curriculum in Fisheries and Wildlife Biology

Administered by the Department of Animal Ecology. The curriculum provides broad training in both fisheries and wildlife biology. Students may pursue special interests through elective courses and summer employment.

Cr.  Degree Requirements
11.5-12.5 Communications
   Engl 104, 105; Sp 211; Lib 160; one other approved communications course
9-12 Mathematical sciences
   Math 140 and 141, or 142; Stat 104, one other approved mathematical sciences course
15-16 Physical sciences
   Chem 163, 163L, 164; Phys 111 and 112, or Phys 106 and one of the following: Agron 154, Geol 100, Geol 210, or Chem 231 and 232
   35 Biological sciences
   A Ec 110, 300, 300L, 321, 322, 323, 324, 325, 410; Biol 110, 110L, 312, Bot 207, Zool 206, 206L; one other approved advanced botany course
11 Fisheries and wildlife management
   A Ec 231, 350, 440, 441, 451
6 Humanities
7 Social sciences
   Pol S 215, Econ 201
5-6 Administration, policy, and law
   Two approved courses
   R Practical experience requirement (Ag 104)
10-14 Restricted electives
   Selected from list of approved courses
   Free electives
6.5-18.5
128 Total credits

Typical Program for the First Year

Cr.  Fall
4 Principles of Biology — Biol 110, 110L
1 Orientation in Animal Ecology — A Ec 110
5 General Chemistry — Chem 163, 163L
3 Freshman Composition — Engl 104
3 Fundamentals of Algebra for Science and Higher Mathematics — Math 140

Spring
2 Wildlife Resource Conservation — A Ec 231
3 General Chemistry — Chem 164
3 Freshman Composition — Engl 105
2 Trigonometry — Math 141
5 General Zoology — Zool 206, 206L
0.5 Library instruction — Lib 160

Curriculum in Food Technology

Cr.  Degree Requirements
9.5 Communications
   Engl 104, 105 and 414 or Sp 211; Lib 160
9-10 Mathematical sciences
   Math 140 or 141, 160; Stat 104
19-20 Physical sciences
   Chem 177, 177L, 211, 231 or 331 and 332, 232 or 333 and 334, Phys 106 or 111 and 112
11 Biological sciences
   Biol 110, 110L; Bact 300; BB 301
5 Social sciences
   Econ 201; elective (2 cr)
6 Humanities
38 Food technology
   F Tch 101, 102, 110, 301 or 302 or An S 370, 401, 402, 405, 410, 411, 420, 421, 425, 460, 493, 494
5 Food and nutrition
   F N 107, 304
18.5-26.5
Free electives
128 Total credits

Typical Program for the First Year

Cr.  Fall
3 Freshman Composition — Engl 104
3 or 2 Fundamentals of Algebra — Math 140 or Trigonometry — Math 141
5 General Chemistry — Chem 177, 177L
3 Food and the Consumer — F Tch 101
R Orientation in Food Technology — F Tch 110

Spring
3 Freshman Composition — Engl 105
1 Food Quality Evaluation — F Tch 102
4 Principles of Economics — Econ 201
3 Principles of Biology — Biol 110
1 Laboratory in General Biology — Biol 110L
0.5 Library instruction — Lib 160
3 Humanities elective

Preveterinary Studies
Preparation for admission to veterinary medicine may be accomplished through the food technology curriculum.
Curriculum in Forestry

Students majoring in forestry are required to choose one of the following options: forest products, forest recreation, forest resource management. Special programs:

- **Cr. Degree Requirements**

  11.5 Communications
  - Lib 160; Engl 104, 105, 414; Sp 212
  22 Mathematical and physical sciences
  - Math 140, 141, 150, 151; Stat 104;
  - Com S 175; Chem 163, 163L
  9 Biological sciences
  - Biol 110; Bot 207; 256
  7 Social sciences
  - Econ 201; Soc 130
  6 Humanities

  33.5 Forestry courses
  - For 101, 1011, 110, 201, 202, 203, 204, 241, 301, 360, 380, 380L, 451, 453, 454, Ag 104

  **Options**

  28-29 Forest products
  - For 397, 481, 485, 486, 487; B B 221 or Phys 111; E 375; PP SW 416; Soc 382

  17-18 Electives
  29 Forest recreation
  - Agron 357; A Ec 231; Ag M 325; For 302, 344, 414, 470; L A 301, Pol S 371; Soc 382, 383

  17 Special programs
  30 Forest resource management
  - Agron 357; B B 221; C E 215A.
  - For 302, 342, 397, 445; E 375, PP SW 416; Soc 382

  18 Electives
  45 Special programs
  - Designated courses in approved special program including For 397 and 9 additional credits in forestry courses. See adviser.

  **135 Total credits**

*Forestry students are urged to use elective credits to develop a strong minor. See adviser.

**Typical Program for First Year**

**Cr.**

- Fall
  3 Principles of Biology — Biol 110
  3 Freshman Composition — Engr 104
  2 Introduction to Forestry — For 101
  0.5 Orientation in Forestry — For 110
  0.6 Library Instruction — Lib 160
  3 Fundamentals of Algebra — Math 140
  3 Rural Institutions and Organization — Soc 130
  15

**Spring**

- 3 General Botany — Bot 207
- 4 General Chemistry — Chem 163
- 1 Laboratory in General Chemistry — Chem 163L
- 3 Applied Computer Programming — Com S 175
- 3 Freshman Composition — Engr 105
- 1 Introductory Laboratory in Forestry Practice — For 101L
- 2 Trigonometry — Math 141
  17

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**Curriculum in Horticulture**

Students majoring in horticulture will select an option in which to specialize prior to reaching junior standing, and will fulfill the requirements described below under Specialization Options.

**Cr. Degree Requirements**

9.5 Communications
- Engl 104, 105; Lib 160; Sp 211

20-22 Mathematical and physical sciences
- Chem 163, 163L, 164, 164L, 231, 232A; Math 104 or 140 or 150 or 165; Stat 101 or 104 or 227

25-27 Biological sciences
- Biol 109 or 110; Bot 207 and 310 or 320; Ent 376; Gen 320 or 330; PP SW 407; and two courses from the following group: Bot 306, 404, or PP SW 216

10 Social sciences
- Econ 201; Psych 101, electives
  (3 cr.)

6 Humanities
6 Agricultural sciences
- Agron 154, 354.

24-28 Horticultural sciences
- Hort 110, 221, 322, 410, and six courses from the following groups (at least one from each group):
  - Plant materials: Hort 232, 241, and 433
  - Technical: Hort 225, 342, and 351
  - Food products: Hort 461, 462, and 471
  - Commercial: Hort 322, 432, and 442

12 Specialization options

Production and business management: Engl 302, Acct 284 and 6 or more credits from the following group: Econ 330, Mgmt 213, 315, 370; Mkt 340, 441, 442, 446, 447

Communication and public service: Jl MC 101; Soc Ed 204, 301, and 6 or more credits from the following group: An S 114, Jl MC 201, 202, 225; Psych 230, 333; SocEd 426

Science: Math 165; Phys 111 and 4 or more credits from the following group: B B 301, 311; Chem 211; Com S 175; Engl 414; Math 166; Phys 112

Turfgrass management: Ag M 358; Acct 284 and 7 or more credits from the following group: Agron 201, 406, 406, 453, 457, Ag M 324, 325, 335, 424; PP SW 236

7.5-15.5 Electives

**128 Total credits**

*International agriculture is one of two alternative programs for securing a secondary major emphasizing the international dimension. Agricultural students can select the course of study described above or they can choose to follow the alternate program, International Studies in the College of Agriculture. For information on the alternate program, see Index, International Studies in the College of Agriculture.

**Typical Program for the First Year**

**Cr.**

- Fall
  3 Principles of Biology — Biol 110
  4 General Chemistry — Chem 163
  1 Laboratory in General Chemistry — Chem 163L
  3 Applied Computer Programming — Com S 175
  3 Freshman Composition — Engr 105
  1 Introductory Laboratory in Forestry Practice — For 101L
- 2 Trigonometry — Math 141

**Spring**

- 3 Fundamentals of Soil Science — Agron 154

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3 General Botany — Bot 207
4 General Chemistry — Chem 163, 163L
3 Freshman Composition — Engr 105
3 Principles of Horticulture — Hort 221

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Curriculum in Pest Management

Administered by the departments of Agronomy, Animal Ecology, Biochemistry and Biophysics, Entomology, Forestry, Horticulture, and Plant Pathology, Seed and Weed Science. Must be taken as a secondary major in conjunction with a primary major. Students with primary majors in other than the sponsoring departments are not excluded from the pest management program.

Cr. Degree Requirements
9.5 Communications
Engl 104, 105; Lib 160; electives
6 Mathematical sciences
Stat 104; electives
11 Physical sciences
Chem 163, 163L, 207, 231, 232A; Agron 206
22-24 Biological sciences
Biol 110, 110L, 312 or For 302; B B 301; Bot 207, 310 or 320; Gen 320; Zool 206
7 Social sciences:
Econ 201, electives
6 Humanities
5-6 Agricultural sciences
Agron 114 or For 101 or For 300 or Hort 221; Agron 154 or 357
19-27 Pest management
P M 216, 340, 376, 407 or 416, 491, 499; electives (any 2 courses from approved list)*
31.5-42.5 Free electives**
128 Total credits

*An approved list of elective courses may be obtained from the pest management advisor in participating departments.
**These electives will normally be occupied by requirements of the primary major.

Typical Program for the First Year
Because pest management is a secondary major, the courses taken by the student during the first year will vary, depending on the primary major (see typical program for the primary major). It is recommended, however, that the following courses be included in the first year’s program:

Cr.
2-3 Principles of Crop Production — Agron 114 or Introduction to Forestry — For 101 or Forest Resource Management — For 300 or Principles of Horticulture — Hort 221
3 Principles of Biology — Biol 110
1 Laboratory in General Biology — Biol 110L
3 General Botany — Bot 207
3 General Zoology — Zool 206

Curriculum in Seed Science

Administered by the departments of Agricultural Engineering, Agronomy, Horticulture, and Plant Pathology, Seed and Weed Science. Must be taken as a secondary major in conjunction with a primary major. The seed science program is designed for students with career interests in one or more aspects of the seed industry. Areas of study include: seed production, processing, pathology, physiology, quality control, and marketing, as well as seed plant designs.

Cr. Degree Requirements
12.5 Communications
Engl 104, 105; Sp 211; Lib 160; electives
11 Mathematical sciences
Stat 101 or 104; Econ S 111; electives
16-17 Physical sciences
Chem 163, 163L, 164, 164L; B B 221 (or Chem 231, 232A); Phys (4 cr.)
21 Biological sciences
Biol 106 or 110; Bot 207, 310; Ent 376; Gen 320; PP SW 216, 407
7 Social sciences
Econ 201; electives
6 Humanities
1 Laboratory in General Biology — Biol 110L
3 General Botany — Bot 207
3 General Zoology — Zool 206

Curriculum in Public Service and Administration in Agriculture

Administered by the Department of Sociology and Anthropology.

Cr. Degree Requirements
11.5 Communications
Engl 104, 105; Sp 211; Jl MC 225; Lib 160
13 Mathematical and physical sciences
Math 150, 151; Stat 101; electives (3 cr.)
6 Biological sciences
Biol 101; electives (3 cr.)
6 Humanities
15 Sociology
Soc 110, 130, 310, 411 or 415, 420, 464
14 Economics
Econ 201, 309, 405, 451
15 Political science
Pol S 215, 310 or 311, 371, 475, 484
8 Agricultural sciences
15 Required minor
24.5 Free electives
128 Total credits

*An approved list of elective courses may be obtained from the seed science advisor in administering departments.

Typical Program for the First Year
Because seed science is a secondary major, the courses taken by the student during the first year will vary, depending on the primary major (see typical program for the primary major).
College of Design

Michael P. Brooks, Dean
Herbert W. Gottfried, Associate Dean
Mary Kihl, Assistant Dean
Carole Remele Tilden, Assistant to the Dean

Departments of the College

Architecture
Art and Design
Community and Regional Planning
Landscape Architecture

The mission of the College of Design is to educate persons entering the design professions, to provide professional growth and enrichment opportunities for design practitioners, to engage in research and related activities that serve to expand and advance the design professions, and to inform the public concerning the need for and appreciation of good design practices.

The college offers opportunities to study in many design-related fields, as well as a general or liberal education for personal and community roles.

Recommended High School Preparation
Recommended high school preparation for students entering all departments of the College of Design includes 4 years of English composition and rhetoric, 3 years of algebra and 2 years of science (biology, chemistry, or physics). The Department of Architecture recommends 2 years of algebra, 1 year of geometry, ⅔ year of trigonometry, ⅔ year of physics, and 1½ years of chemistry. Students in the Department of Architecture who have not had one year of high school chemistry are required to complete Chemistry 50.

For students entering all departments, high school courses in art and in drafting are highly recommended.

Professional Opportunities in Design
Graduates of the College of Design are employed in commercial and private firms, government, industry, and education. Programs of study in the college prepare students for careers in architecture, landscape architecture, environmental design, interior design, city and regional planning, advertising design, and teaching. Employment as a museum or art program director, crafts director, or studio artist are among the many other career possibilities.

Curricula in the College of Design
A student has a variety of curricula from which to choose. Each curriculum is unique, yet there are many courses common to several curricula. The major difference found among curricula is the course work related to the career or area of emphasis. Many of the programs are accredited by professional societies. Each department prepares a curriculum guide available to assist students in planning their long-term programs and specifying the exact requirements for graduation. Students may use their electives to broaden their education, to strengthen their area of specialization, or in some cases to meet the requirements for two programs of study.

The undergraduate curricula are:

Advertising Design
Architecture
Art Education
Art and Design
Community and Regional Planning
Craft Design
General Art
Interior Design
Landscape Architecture

The graduate curricula are:

Architecture
Art and Design
Community and Regional Planning
Landscape Architecture

Advising System
Each student in the College of Design is assigned an academic adviser who is associated with the curriculum in which the student is majoring. Advisers assist students in developing academic programs of study and provide information on vocational choices. Students who are uncertain of their primary direction within the college are encouraged to explore courses related to several curricula.

Requirements in the College of Design
All students in the College of Design are expected to meet the following requirements of the college.

Design Core
Students will normally complete these courses during their first year

Cr. 3 History of Design — Dsn S 121
3 Design and Society — Dsn S 137
3 Fundamentals of Visual Expression and Communication — Dsn S 140

Total 9

General Education Requirements

6 I. Biological and physical sciences and mathematics
(Includes courses in the fields of agronomy, astronomy and astrophysics, biology, botany, chemistry, computer science, food and nutrition, genetics, geology, materials science and engineering, mathematics, meteorology, physics, statistics, and zoology)

6.5 B. Communications
(Includes Eng 104, 105; Lib 160)

6 III. Humanities
(Include courses in the fields of foreign languages, history, literature, music theory, philosophy, religious studies, and theatre)

6 IV. Social sciences
(Includes courses in the fields of anthropology, economics, family environment, geography, political science, psychology, and sociology)

24.5 Total credits
See departmental curricula for additional general education requirements

Requirements for Basic Program in the Department of Art and Design
Students are advised to seek faculty council regarding majoring in art and design before undertaking the following course groupings. All students will complete the following course and grade-point requirements before entering a department curriculum.

Cr. Group A
6 English 104, 105
0.5 Library 160
3-6 Biological and physical sciences and mathematics
3-6 Social sciences
3-6 Humanities
18.5

Group B
9 Design core — Dsn S 121, 137, 140
3-6 Art history
9-12 Art and design studio: select from Art 170, 203, 205, 220, 222, 227, 233, 235, 243, 244, 261, 270, 247 or 346 or 347.
Fr E 125

24.0

42.5 Total credits
At completion of Group A courses with a minimum 2.0 cumulative grade point average and Group B courses with a minimum 2.5 cumulative grade point average, a student will enter a specific department curriculum. Students not achieving these minimum grade point averages will be required, if they still wish to enter a department curriculum, to take additional courses in Group A, retake courses in Group B, or enter special circumstances petition for acceptance into the program.

*To meet requirements for graduation, a minimum grade of C must be received in 104 and 105.

Requirements for Professional Programs
Several curricula require portfolio review and/or a minimum cumulative grade point average at stated times during progress toward a professional degree. In some instances this occurs when students have completed a basic program or a stated group of courses, and successful fulfillment of these requirements is necessary before the student will be permitted to enroll in advanced or professional courses in the particular program.
Honors Program

The College of Design participates in the Honors Program, which encourages outstanding students to develop programs to fit their talents, abilities, or professional goals. For further information, contact the chairman of the College Honors Committee.

Design Studies

In addition to the courses taught by the four departments, the College of Design offers interdisciplinary courses. See "Design Studies" under Courses and Programs.

Curriculum in Advertising Design

Administered by the Department of Art and Design. Leading to the Bachelor of Arts degree. Total credits required for graduation: 126.5. This curriculum is planned for students preparing to enter the professional field of advertising design. Students may enter this curriculum following completion of the Basic Program in Art and Design.

Cr. Degree Requirements
9 Biological and physical sciences and mathematics
9 Social sciences
9 Humanities
9.5 Communications
Engl 104, 105, Lib 160; Engl or Sp 211 option

9 Design core
Dsn S 121, 137, 140

9 Art history
Art 280, 281, 369 or 391

6 Art and design studio options

36 Professional concentration
Art 170, 203, 233, 236, 270, 333, 350, 358 or 359, 370, 375, 470, 471

3 Technical drawing — Fr E 125

9 Journalism and mass communication
Jl MC 312, 325, 342

Electives

126.5 Total credits

Curriculum in Architecture

The department offers several undergraduate and graduate degree programs as follows:

A 127.5-credit undergraduate program leading to the degree Bachelor of Arts in Architecture, a preprofessional degree.

A 30-credit undergraduate program leading to the degree Bachelor of Architecture, a professional degree, following the 127.5 credit Bachelor of Arts in Architecture degree program.

Several graduate programs leading to the degree Master of Architecture, a professional degree.

(For graduate program descriptions see Graduate Study under Architecture in the Courses and Programs section.)

Students are advised to seek faculty counsel regarding a career in architecture prior to undertaking their Basic Group* courses.

Admission of a student into other courses in the Department of Architecture is subject to his/her having received a 2.3 cumulative grade point average in 48 credits of his/her Basic Group courses constituted from the following courses:

Cr. Basic Group Courses
9 Dsn S 121, 137, 140
6 Social sciences or humanities
5 Phys 221
6 Engl 104, 105
11 Arch 200, 235, Fr E 145, 146
8 Math 165, 166
3 Arch 321
0.5 Lib 160

*In addition, students who are not adequately prepared may be required to take Math 140, 141, 142 and/or Chem 50, none of which may be used to satisfy credit requirements for graduation in the Department of Architecture.

Curriculum in Art and Design

Administered by the Department of Art and Design. Leading to the Bachelor of Fine Arts degree. Total credits for graduation: 145.5. This degree will prepare the student for a career in art and design or for entrance into a graduate program.

Students seeking to enter the Bachelor of Fine Arts program of study should make application after having successfully completed 65 semester credit hours, including at least 36 hours in the College of Design. A minimum 2.75 grade point average is required for courses outside of the College of Design and a 3.00 grade point average for courses in the College of Design. As part of the application process, the student will be required to present a portfolio of art and design work for review.

Cr. Degree Requirements
9 Biological and physical sciences and mathematics
12 Social sciences
12 Humanities
9.5 Communications
Engl 104, 105; Lib 160; option
9 Design core
Dsn S 121, 137, 140
30 Art and design studio options
12-15 Art history
Art 280, 281, options
33-42 Professional concentration**
7-19 Electives
R Senior BFA exhibition

145.5 Total credits

**See adviser for curriculum planning.

Curriculum in Art Education

Administered by the Department of Art and Design. Leading to the Bachelor of Arts degree. Total credits for graduation: 128.5. This curriculum is planned for students preparing for certification to teach art in grades kindergarten through twelve. Students may enter this curriculum following completion of the Basic Program in Art and Design.

Cr. Degree Requirements
9 Biological and physical sciences and mathematics
12 Social sciences**
Psych 230, 312; American government; option
12 Humanities
Art 280, 281; Phil 201 or 230; Phil 340

9.5 Communications
Engl 104, 105; Lib 160; Sp 211

9 Design core
Dsn S 121, 137, 140
3 Art history option
6 Art and design studio options
12 Professional education
Psych 333; SecEd 204; 301, 406, 426

49 Professional concentration
Art 212, 213, 312; 415, 417, 418; art studio options

10 Electives

128.5 Total credits

**Departmental office will provide a list of courses requirements relating to specific B.F.A. programs.

39
**Curriculum in Community and Regional Planning**

Leading to the degree Bachelor of Science. Total credits required: 128.5.

Planning areas of specialization include: administration, city as a system, economic planning, environmental planning, housing and neighborhood revitalization, human resource planning, policy development and planning, state and regional planning, transportation planning, urban design, and urban information systems.

**Cr. Degree Requirements**

12.5 Communications
- Engl 104 and 105, Engl 414; Lib 160, Sp 211
- Humanities
- Mathematics
- Natural sciences
- Social sciences
- Community and regional planning

12 Design core
- Dsn S 121, 137, 140

40 Electives

128.5 Total credits

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**Curriculum in General Art**

Administered by the Department of Art and Design. Leading to the Bachelor of Arts degree. Total credits required for graduation: 126.5. This curriculum provides students with a liberal education in the visual arts. A strong general education is provided with art and design foundation courses, an art concentration, a recommended minor area, and electives.

Students may enter this curriculum following completion of the Basic Program in Art and Design.

The minor must consist of 15 credits in the minor department or discipline. Credits in the minor area may not be included in group requirements. Options for minors may include theatre, music, film, literature, period minors, or individual minors designed within department guidelines.

**Cr. Degree Requirements**

12-14 Biological and physical sciences and mathematics
- Biol 109 or Biol 110, astronomy, botany, chemistry, genetics, geology, mathematics, physics or zoology options

12-13 Social sciences
- Anthro 111 or Soc 134; Pol S 215, Psych 101; anthropology, economics, political science, psychology, or sociology options

18-21 Humanities
- Hist 201, 202, Phil 201, 340, literature, music, or speech options

13.5-15.5 Communications
- Engl 104, 105, 204, Lib 160, English, journalism or speech options

9 Design core
- Dsn S 121, 137, 140

12 Art history
- Art 200, 281; options

6 Art and design options

12 Art and design concentration
- Select from art, craft design, design, drawing, drawing and fashion illustration, drawing and painting, drawing and printmaking, painting

15 Minor area
- Select from courses outside the Department of Art and Design

9-17 Electives

126.5 Total credits

*Departmental office or advisor will provide a list of approved courses which may be used to meet requirements.

**See advisor for curriculum planning.**

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**Curriculum in Landscape Architecture**

The department offers a 5-year curriculum, requiring 149.5 credits, leading to the degree Bachelor of Landscape Architecture. These credits are distributed between a 2-year preprofessional program of 59.5 credits and a 3-year professional program of 90 credits.

Admission into the professional program is subject to the approval of a faculty committee at the completion of the preprofessional program. Scholastic performance, aptitude, and personal development are the qualifications considered. Preprofessional credits must average at least 2.30 on a 4.0 marking system and this minimum must be maintained through graduation.

**Cr. Degree Requirements**

12 Biological and physical sciences and mathematics
- Biol 109; Math 140, 141; Phys 111

9.5 Communications
- Engl 104, 105, Lib 160, Sp 211

12 Design core
- Dsn S 121, 137, 140, 145 or option

5 Engineering
- C E 215A; Con E 241

4 Landscape architecture — A LA 241

3 Soils — Agron 156

9 Biological and physical sciences
- Biol 312; Bot 207, Geol 100

3 Communications
- Engl 302

4 Design studies option

6 Humanities
- Phil 201 or 230, 340

48 Landscape architecture
- A LA 251, 271, 321, 322, 342, 361, 443, 444, 452, 453, 462, 463, 472

6 Plant sciences
- Hort 221, 342

12 Social sciences
- C R P 270, 293; options

18 Electives

149.5 Total credits
College of Education

Departments of the College

Elementary Education
Industrial Education
Physical Education and Leisure Studies
Professional Studies in Education
Secondary Education

The College of Education provides degree programs leading to certification in elementary education, industrial education, and physical education as well as a professional sequence of courses for all students at Iowa State seeking a teaching certificate. In addition, the college offers certain professional programs in nonteaching fields. Certain professional programs are also available at the graduate level.

A person who is to work effectively with people needs broad personal and professional knowledge and understanding. The College of Education strives to provide each student with a sound general education as well as preparation in an area of specialization.

In addition, a prospective teacher must have an understanding of teaching and of learning, and skill in applying such understanding in the classroom. An awareness of the characteristics of growth and development of students and the role of learning in society is also needed.

The teacher education program at Iowa State University is accredited by the National Council for Accreditation of Teacher Education. All students who are recommended by Iowa State University for teacher certification must meet the requirements of the teacher education program and be recommended by the College of Education. Each student will be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located.

Recommended High School Preparation
Students will find it beneficial to have at least three years of English/speech with emphasis in composition and communication skills and a general background in mathematics, natural sciences, social sciences, and humanities.

Curricula and Special Programs in the College of Education

Elementary Education — curriculum in elementary education, with areas of concentration in most academic disciplines, the exceptional child, the culturally different child, and a sequence of courses for approval in mental disabilities and in reading. Certification programs at the graduate level in emotional disabilities and learning disabilities. Additional graduate work in elementary education and in gifted and talented.

Industrial Education — curriculum in industrial education, with industrial arts teaching option, industrial vocational-technical education option, the industrial option, and the occupational and traffic safety education option.

Physical Education — curriculum in physical education and leisure studies. Departmental offerings include the physical education K-12 and secondary certification options with specialization opportunities available in athletic training, coaching, and dance, the physical education general (non-certification) option; the dance (non-certification) option; the coaching endorsement; the health certification program; and a major program in leisure studies.

Professional Studies in Education — All graduate programs are based upon a major in education, with specializations in adult and extension education; educational administration; counselor education; curriculum and instructional media; higher education; historical, philosophical and comparative education; research and evaluation; elementary education; and learning disabilities.

Secondary Education — Provides certification programs in conjunction with subject matter areas of agriculture, art, biology, chemistry, earth sciences, English, foreign languages, general sciences, home economics, journalism and mass communication, mathematics, music, physical science, physics, psychology, social studies, and speech.

Environmental Studies (second major only) — The College of Education participates in the Environmental Studies Program and offers a major in environmental studies that may be taken only as a second major. Students pursuing a second major in environmental studies must complete the Environmental Studies Program as described in this catalog (see Index, Environmental Studies).

Admission to Undergraduate Teacher Education Program

A student seeking admission to a teacher education program must be accepted by a selection committee for the specific program which he or she seeks to enter. Factors considered in evaluating applications include scholarship, interest in teaching, character, and physical and mental health. Recommendations by selection committees must be confirmed by the University Committee on Teacher Education before admission to the program in teacher education is granted.

Students may apply as early as three semesters before the one in which they plan to enroll for student teaching; however, they must be fully admitted into the Teacher Education Program by mid-semester prior to their planned student teaching semester. A 2.3 quality-point average is required for full admission to the teacher education program and this minimum average must be maintained through graduation.

The General Education Requirement

Students in the College of Education and all prospective teachers are required to complete a program in general education which is integrated with their professional training and extends through the undergraduate curriculum.

The general education program emphasizes intellectual growth and personal development as contrasted with specific vocational preparation. It is recognized that many contributions to general education may be made by courses which have other primary objectives.

The program aims to stimulate a desire for learning and intellectual endeavor, develop understanding and appreciation for the physical and cultural world, encourage independent thinking and analysis, increase competence in all aspects of communication, and create an understanding of individuals as social, psychological, and physical beings.

The student is expected to complete studies in five groups in general education. Areas represented below are not departmental titles. In some cases, courses relating to a given area may be found in several different departments. Credits listed are minimum requirements.

| Cr. | I. Biological sciences, physical sciences, and mathematics | 9 |
|     | II. Social sciences | 34 |
|     | III. Humanities | 34 |
|     | IV. Communication skills | 34 |
|     | V. Health, dance, physical education, safety | 8 |
|     | Additional credits in above areas | 42 |

A student must have 42 semester hours in general education outside his or her academic major or minor, with the minimum in each area as shown above. This total will include Engl 104 and 105, Sp 211 or equivalent, and Lib 160. Additional credits in general education may be required by departments preparing teachers.

Teacher Certification

The Iowa Professional Certificate may be recommended for those who hold the bachelor's degree from Iowa State and who have completed the following:

1. All requirements of an approved teacher education program, including the human relations requirement of SecEd/EED 406 and one course designated as appropriate for the human relations requirement.
2. A minimum of 42 semester hours in courses designed to serve the general needs of college students. This total will include Engl 104 and 105, Sp 211 or equivalent, Psych 230, one course in American history or American government, and Lib 160.

For full-time teaching in secondary schools an approved subject matter concentration of at least 30 semester hours is required. A second subject matter area of at least 20 semester hours is possible but not required.

Approval for the nursery school-kindergarten certificate requires the successful completion of the curriculum in the Department of Child Development.

Graduate programs are available for those who seek approval as elementary and secondary school principals, superintendents, counselors, instructional media specialists, or teachers in junior and community colleges. Students also may pursue a program for approval to teach in the area of learning disabilities and/or emotional disabilities.

Approval for the school psychologist certificate requires the successful completion of that curriculum in the Department of Psychology.

Information concerning certificates not described above, as well as more detailed requirements for any certificate, may be obtained from the Dean of the College of Education.

The Professional Teacher Education Requirement
As part of a total educational program, the prospective teacher must complete certain studies related directly to the profession of teaching. All students in teacher education take the following courses:

Cr.
3 The School in American Life — SecEd/El Ed 204
1 Instructional Media — SecEd/El Ed 301
2 Educational Psychology — Psych 333
2 Multicultural Awareness and Non-sexism in the Classroom — SecEd/El Ed 406

The additional courses required by specific teaching areas are:

Elementary Education
See Curriculum in Elementary Education

Prekindergarten-Kindergarten Education
See Index, Child Development for complete requirements.

Secondary Education
Cr.
3 or 4 Principles and Issues of Secondary Education — SecEd 425
8 Student teaching (minimum — 8 weeks)

Professional Courses in Areas of Specialization
Ag Ed 211, 311, 410, 411, 417
Art 212, 213, 312, 415, 417, 418
Biological — S-H 417D, 486
Chemistry — S-H 417B, 486
Earth Science — S-H 417J, 486
English — Eng 494, S-H 417E
Foreign Languages — F Lng 476, S-H 417G
General Science — S-H 417B, 486
Health Education — H 3 375, 417, 418
Some Economics Education — H Ed 410, 412, 417
Industrial Education — I 1 Ed 217, 312, 415, 417
Journalism — Jl MC 480, S-H 417I
Mathematics — Math 497, S-H 417C
Music — Music 464, 465, 466, S-H 417K or 417L
Physical Education — PE 375, 417, 418, 475
Physics — S-H 417B, 486
Safety Education — Saf 317, 415, 415
Social Studies — S-H 417A, 487
Speech — Sp 495, S-H 417F

The Requirements for Areas of Specialization in Teacher Education
A teacher must also be competent in the area of a teaching specialization. Certain competencies are required of those who would teach at prekindergarten-kindergarten or the elementary level, for instance, while a depth of knowledge in some particular subject matter is necessary for those who would be teachers at the secondary level.

Agricultural Education
See Curriculum, Agriculture.

Art
See Curriculum, Art Education, Department of Art and Design

Biology
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Chemistry
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Coaching Interscholastic Athletics
Students seeking endorsement to coach interscholastic athletics must:

a. Satisfy the professional teacher education requirements of the College of Education

b. Satisfy the requirements of a teaching specialization area

c. Earn credits in the following: PE 220 (prereq. Zool 156), 301-312 (select one course), 355 (prereq. Physics 101 or 106 or 111), 402, 455, 486.

Earth Sciences
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Elementary Education
See Curriculum, Elementary Education

English
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses

Foreign Languages
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

General Science
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Health Education
Students seeking approval for health education must earn credits in the following courses: H S 110, 215, 250, 305, 310, 390; F N 107; PE 163, Psych 360 or 382 or 460; U St 221 or 222 or 425 or Saf 201; Soc 219 or 327 or Zool 258; Soc 485 or F E 201; Zool 155, 156.

Students seeking approval for health education as a second subject area must earn credits in the following courses: H S 110, 215, 250, 305, 310, 390; F N 107; Soc 327 or 485 or F E 201 or Zool 258; Zool 155, 156.

Home Economics
See Curriculum, Home Economics.

Industrial Education
See Curriculum, Industrial Education.

Journalism and Mass Communication
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Mathematics
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Music
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Physical Education
See Curriculum, Physical Education

Physical Science
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Physics
See Sciences and Humanities, Cross-Disciplinary Studies, Teacher Education Programs, Subject Matter Courses.

Prekindergarten-Kindergarten Education
See Index, Child Development for complete requirements.

Safety Education and Driver Education
All students who qualify for approval to teach safety education and driver education must have preparation in some major area of specialization. Such students then may obtain approval to teach safety education and driver education by earning the following credits:

18 semester hours required
Saf 201, 208, 317, 415, 416
H S 215.
3 semester hours chosen from
Saf 210, 401, 420, 430, 490;
H S 165, 110, Psych 211, 312, Soc 264
Curriculum in Elementary Education

The curriculum in elementary education is planned for students preparing to teach in grades kindergarten through sixth. For additional information see Index, Courses and Programs.

Total credits required: 128.

45 General Education*
12.5 Communication skills
Engl 104 (3), 105 (3), Sp 211 (3), Library 160 (0.5)
9 Social sciences
Econ 201 (4 cr.), Pol S 215 (3)
6 Humanities
2.5 Health, dance, physical education, safety
12 Sciences and math
Biological science — 1 course minimum
Physical sciences — 1 course minimum
Math — 3 cr. minimum (select from Math 105, 150, 195)
3 Additional credits (from above areas)
47 Elementary Education
7 Block I (3 courses taken concurrently)
204 (3), 250 (3), 280 (1)
10 Block II (4 courses taken concurrently)
345 (3), 375 (4), 391 (1), 468 (2)
16 Block III (both taken during the same semester)
417A or (C) B, 417B or (C) C
8 Required:
445 (4), 446 (4)
6 Select from:
360 (3), 447 (3), 450 (3), 460 (3), 475 (3)
Required Courses
8 Required core
Psy 333 (3), Ed 406 (2), C D 226 (3)
6 Options (select from)
C D 240 (3), Sp 275 (3), Art 212 (4), Sp
382 (3), H S 105 (2), U S 225 (3), H S
275 (2), P E 294 (3), Music 365 (3)
15 Area of Concentration
Courses selected for an in-depth study of an area in which the student is interested and which is relevant to elementary school teaching.
7 Electives (unrestricted)
Orientation: Required
Freshman Orientation — Ed 100
Sophomore Orientation — Ed 200
Transfer Orientation — Ed 300

Refer to departmental curriculum sheet for specific course requirements.

Curriculum in Industrial Education

The curriculum in industrial education is planned for students preparing to teach or to enter industry. The teaching option provides preparation for teaching of industrial arts in junior or senior high schools, or traffic safety education, or to secure industrial vocational-technical certification with endorsement 71. Within selected apprenticeable occupations, credits may be earned through competency examinations. The industrial option provides preparation for employment in business or industry, particularly in personnel, sales, communication, contracting and construction, maintenance, production, or occupational safety.

Total credits required: 128

For additional information see Index, Courses and Programs.

42 General Education
10 Physical sciences, mathematics
Chem 160 (3 cr.), Phys 106 (4 cr.), Math 142 (3 cr.)
13 Social sciences
Teaching Option and I.V.T.E.: Psych 230 (3 cr.), Econ 201 (4 cr.), Pol S 215 (3 cr.), Soc 134 (3 cr.)
Industrial Option and Safety: Psych 101 (3 cr.), Econ 201 (4 cr.), Pol S 215 (3 cr.), Soc 134 (3 cr.)
6 Humanities
History (3 cr.) plus 3 other credits in humanities
9.5 Communication skills
Engl 104 (3 cr.), Engl 105 (3 cr.), Sp 211 (3 cr.), Lib 160 (0.5 cr.)
3.5 Health, dance, physical education, and safety
Industrial Option: Edu 201 (3 cr.); P E (0.5 cr.)
Teaching Option, I.V.T.E., and Safety
1 credit in health, dance, physical education and safety; 2.5 credits in any other general education courses

Industrial Education Options

43 Technical core
(Consists of three clusters: E, P, GC, and M&P.)
1 Introduction to Industrial Education — 1 Ed 110
3 Introduction to Graphic Communication — 1 Ed 120
3 Introduction to Materials and Processes — 1 Ed 130
3 Introduction to Energy — 1 Ed 140
3 Graphic Image Generation — 1 Ed 221
3 Industrial Materials and Processes — 1 Ed 231
3 Energy and Power Systems — 1 Ed 240
3 Industrial Enterprises System — 1 Ed 460
3 Facility Planning and Management — 1 Ed 410

The student will also be required to take the following:
6 One additional course in each of two of the three clusters at the 200 level.
6 6 Ed credits at the 300 level.
6 6 Ed credits at the 400 level.

40 Professional
3 Foundations of American Education — Sec Ed 204.
1 Instructional Media — Sec Ed 301
3 Principles and Issues of American Education — Sec Ed 426
2 Multicultural Awareness and Non-sexism in the Classroom — Sec Ed 406
2 Introduction to Observation in Industrial Arts Teaching — I Ed 217
3 School Laboratory Safety — I Ed 310
3 Foundations of Industrial Arts — I Ed 312
4 Methods of Teaching Industrial Arts — I Ed 415
16 Supervised Student Teaching — I Ed 417 A (8 cr.), B (8 cr.)
3 Educational Psychology — Psych 333
3 Electives
Cr. B. Industrial Option
43 Technical core (same as Option A)
29 Professional
3 Computer Programming
3 Business Communications — Engl 302 (3 cr.)
3 Writing of Professional Papers and Reports — Engl 414 (3 cr.)
2 Industrial Accounting — Acct 381
2 Industrial Organization and Work Analysis — I Ed 375
2 Human Resource Management — I Ed 424
4 Mathematics or statistics
3 Psychology — Psych 450
3 Business and Professional Speaking
Sp 312 (3 cr.)
3 Persuasion — Sp 327 (3 cr.)
3 or Group Discussion and Leadership — Sp 317 (3 cr.)
3 Fluid Power — I Ed 445
3 Handling of Products and Hazardous Materials — Saf 315
14 Electives
Students are encouraged to select electives from the following subject areas: Architecture, computer science, economics, English, forestry, business administration, industrial engineering, journalism, mathematics, physics, psychology, speech.
Cr. C. Industrial Vocational Technical Education (I.V.T.E.)
38 Technical core
0-30 Teaching specialty — I.V.T.E. 300
300. Occupational Competency, Cr. up to 30 semester hours. Prereq. Approval from department head, enrolled in B S degree (I.V.T.E.) and have planned program leading to endorsement 71 (post secondary), have met the industrial experience requirement for vocational approval, have junior classificaation, have completed 15 (quarter) credits at I.U. prior to receiving credit for occupational competency. Competence in the following occupational clusters is determined through completion of oral, written, and performance examinations. See Industrial Education Department Competency Test Program guidelines for additional information.
A. Automotive and Power Mechanics
B. Building Trades
C. Commercial Art
D. Drafting and Graphics
E. Electricity-Electronics
F. Metal Trades
6 Courses related to specialization
2 Courses not related to specialization
I.V.T.E. students not enrolled in the occupational competency program (I.V.T.E. 300) described above will select 30 credit hours from the technical core group for Option A. The courses selected will be approved in accordance with the specialty chosen.
36 Professional
3 Educational Psychology — Psych 333
3 Orientation to Teaching Industrial Vocational Technical Education Programs — IVTE 380
2 Foundations of I.V.T.E. — IVTE 381
2 Occupational Analysis and Course Construction in I.V.T.E. — IVTE 382
3 Techniques of Teaching I.V.T.E. — IVTE 383
4 Facilities Planning, Organization, and Management of the I.V.T.E. Laboratory — IVTE 384
2 Evaluation in I.V.T.E. — IVTE 391
2 Coordination and Administration of I.V.T.E. — IVTE 492
2 Human and Public Relations for Industrial Vocational Technical Education — IVTE 493
2 Supervision and Administration of I.V.T.E. — IVTE 494
2 Career Development Teaching Practices in I.V.T.E. — IVTE 495
2 School Laboratory Safety — I Ed 310
2 Multicultural Awareness and Non-sexism in the Classroom — Sec Ed 406
12 Electives
Cr. D. Occupational and Traffic Safety Option
1. Occupational Safety
25 Technical core
1 Introduction to Industrial Education — I Ed 110
3 Introduction to Graphic Communication — I Ed 120
3 Introduction to Materials and Processes — I Ed 130
3 Introduction to Energy — I Ed 140
3 Graphic Image Generation — I Ed 221
3 Industrial Materials and Processes — I Ed 231
3 Energy and Power Systems — I Ed 240
3 Handling of Products and Hazardous Materials — Saf 315
3 Instrumentation for Industrial Hygiene — Saf 471
37 Professional sequence
3 Principles of Accident Prevention — Saf 201
3 Occupational Safety — Saf 202
3 Highway Transportation System Driver Task Analysis — Saf 203
3 Accident Investigation and Records — Saf 210
3 Legal Aspects of the Occupational Safety and Health Act — Saf 330
3 Fire Protection and Prevention — Saf 360
3 Industrial Hygiene — Saf 470
2 Ergonomics in Work System Design — IE 274
2 Human Resource Management 1 — IE 424
2 Human Resource Management 2 — IE 425
3 Industrial Organization and Work Analysis — IE 375
3 Industrial Psychology — Psych 450
3 Writing of Professional Papers and Reports — Engl 414
12 Related courses (select 12 credits from below)
3 Industrial Computer Techniques — IE 209
3 Analysis for Engineering Economy — IE 304
3 Industrial Quality Control and Inspection — IE 361
1 First Aid and Emergency Care — HS 105
2 Drug Education — HS 215
3 Publicity and Public Relations — Ji MC 225
3 General Insurance — I AS 357
3 Small Group Dynamics — Soc 264
3 Persuasion — Sp 327
3 Introduction to Business Statistics — Stat 227
3 Labor Economics — Econ 404
1-4 Safety Internship — Saf 430
3 Energy Applications — I Ed 242
3 Industrial and Construction Safety — I Ed 311
3 Techniques of Teaching IVTE — IVTE 383
12 Electives
Students are encouraged to select electives from the following subject areas: Economics, Business Administration, Industrial Engineering, Mechanical Engineering, Psychology, Physics, Speech.
2 Traffic Safety Education
10 Technical Courses
3 Highway Transportation System Driver Task Analysis — Saf 208
3 Theory and Practice of Multiple-Car and Behind the Wheel Instr — Saf 317
4 Theory and Practice of Simulation and Behind the Wheel Instr. — Saf 416
Curriculum in Leisure Studies

Administered by the Department of Physical Education and Leisure Studies. The curriculum in leisure studies is planned for students preparing to enter the recreation/parks or leisure services profession. For additional information, see Index, Courses and Programs.

Total credits required: 128 (46 credits in courses numbered 300 or above).

8 Professional courses
3 Principles of Accident Prevention — Saf 201
3 Theory and Practicum of Classroom Teaching of Driver Education — Saf 415
2 Drug Education — H S 215
3 Related courses (select 3 credits from below)
3 Accident Investigation and Records — Saf 210
3 Perception and Safety — Saf 401
1-4 Safety Internship — Saf 430
1-4 Independent Study in Safety Education — Saf 490
3 Motorcycle Safety Instruction — Saf 420
1 First Aid and Emergency Care — H S 105
3 Personal and Consumer Health — H S 110
3 Experimental Psychology of Thinking — Psych 211
3 Sensation and Perception — Psych 312
3 Small Group Dynamics — Soc 264
3 General Psychology — Psych 101
4 Principles of Economics — Econ 210
3 Principles of Animal Health — P E 211
3 Communications (minimum credits 6)
3 Communication skills (minimum credits 9.5)
0.5 Library Instruction — Lib 160
6 Freshman Composition — Engr 101, 105
3 Fundamentals of Speech Communication — Sp 211
3 Health, safety, physical education, and dance (minimum credits 2.5)
0.5 Camping Skills and Techniques — P E 176
61 Major
34 Core
R Orientation to Leisure Studies — L S 100
3 Leisure and Recreation: Concepts and Services — L S 201
2 Introduction to Professional Services — L S 283
4 Leadership, Services, and Programs — L S 350
2 Outdoor Recreation: Concepts and Skills — L S 351
3 Dimensions of Recreation in the Campus Community — L S 355
2 Practicum in Leisure Services — L S 383
2 Leisure and Recreation in Relation to Special Populations — L S 394
4 Administration of Leisure Services — L S 483
12 Internship in Leisure Services — L S 483
27 Pan Disciplinary
2 First Aid and Emergency Care — H S 105
3 Principles of Accounting — Acct 284
3 Principles of Organization and Management — Mgmt 370
2 Planning Recreation Systems — L A 301
3 Forest Recreation Resource Management — For 360
3 State and Local Government — Pol S 310
3 Psychology — optional course, 300 level or above
3 Small Group Dynamics — Soc 264
3 Sociology of Leisure and Recreation — Soc 383
2 Publicity and Public Relations — Jl MC 225
25 Electives

*Refer to the department-approved list of courses.

17 Core requirements
R Physical Education Orientation — P E 250
3 History and Philosophy of Physical Education — P E 260
1 Perspectives of Physical Education — P E 270
4 Kinesiology — P E 355
3 Social-Psychological Aspects of Movement — P E 380
3 Principles of Motor Performance — P E 455
3 Physiology of Exercise — P E 455

Options
Physical education certification option (7-12)
3 Perspectives of Physical Education — P E 270
3 History and Philosophy of Physical Education — P E 260
3 Introduction to Sociology — Soc 134
2 Principles of Secondary Education — SecEd 426

Curriculum in Physical Education

The curriculum in physical education is planned for students preparing to teach physical education or to enter related professional areas. The student majoring in physical education may select one of three options: a) physical education certification, b) physical education general (non-teaching), or c) dance. The teaching option leads to certification to teach physical education in grades 7-12 or K-12. The general physical education option is planned for students who are interested in an interdisciplinary approach to the study of human movement. The individualized dance option provides students with a comprehensive view of dance as both a physical skill and a creative art form.

Total credits required: 128 (46 credits in courses numbered 300 or above).
8 Supervised Teaching in Physical Education in the Secondary School — P E 417

Physical education professional theory (minimum credits 17)
1 Teacher Aid — SecEd 280
3 Teaching Physical Education — P E 375
1 Teaching Gymnastics — P E 380
1-2 Basic Aquatic Methods — P E 382 or Water Safety Instructor — P E 115
2 Teaching Modern and Recreational Dance — Dance 395
3 Adapted Physical Education — P E 395
3 Evaluation in Physical Education — P E 470
3 Physical Education Curriculum Design and Program Organization — P E 475

Physical education professional activity skills (minimum credits 11)
Team sports (4 courses)*
Individual and leisure sports (6 courses)*
Gymnastics (1 course)*
Aquatics (1 course)*
Physical fitness (1 course)*
Dance (4 courses)*
Rhythmic analysis (1 course)*
Electives (total credits 21)

*Refer to the department-approved list of courses

Specialization Opportunities

Specialization areas are designed to allow physical education majors to be certified or to complete additional work in the following areas: elementary physical education (K-6), dance, athletic training, coaching and health education

Elementary physical education
The elementary physical education specialization leads to certification to teach physical education in the elementary school
3 Movement Education in Elementary School Physical Education — P E 275
1 Directed Field Experience in Elementary School Physical Education — P E 280
2 Teaching Children's Dance — P E 394
3 Development and Guidance in Middle Childhood — C D 226
8 Supervised Teaching in Physical Education in the Elementary School — P E 418

Dance
General education hours must include 9 credits in the humanities.
2 Dance Appreciation — Dance 270
2 Sound and Movement — Dance 320
History and Philosophy of Dance — Dance 360 (may be substituted for the PE 260 core requirement)
2 Teaching Dance Technique and Composition — Dance 386 or Teaching Children's Dance — P E 384
2 Dance activities (select 5 dance courses)

Athletic training
The athletic training concentration is designed to prepare the student for the National Certification Examination in Athletic Training
3 Introduction to Athletic Training — P E 225
2 Advanced Athletic Training — P E 325
2 Athletic Training Modalities and Rehabilitation — P E 425
3 Practicum in Athletic Training — P E 488
1-2 Coaching theory: select 1 from PE 301-312
2 Drug Education — H S 215

Coaching
2 Athletic Training for Coaches — P E 220
1-2 Coaching theory: select 1 from PE 301-312
1-3 Supervised Coaching in Interscholastic Athletics — P E 486

Health
The health specialization leads to certification to teach health education in the secondary school (For specific requirements, see College of Education, Curricula.)

Physical education general option (non-teaching)
This major is planned for students who are interested in an interdisciplinary approach to the study of human movement. With this major, students have opportunities for careers with recreational agencies, media, institutions, industries, and research labs in universities or colleges. Students choosing this option devise an individualized program of study to meet individual needs and interests.

In addition to the core curriculum requirements, the following courses are to be completed:
4 Physical education activities
Select 4 credits from courses numbered 101 through 199
6 Physical education professional courses
Select 6 credits from physical education courses numbered 250 or above
20 Area of specialization
Area and program must be approved by the Department of Physical Education
Leisure Studies (physical activity specialist)
Health Related Fields (pre-therapy)
Fitness/Commercial Health
Sports Journalism/Advertising
Individualized Program

39 Electives

Dance option
The dance option provides opportunities for students to develop dance talents through an individualized program of study. Choreography, performance, and work in dance production are important parts of this curriculum. The undergraduate program provides a good foundation for graduate work or for entrance into programs of dance therapy, Effort/Shape, and/or

Laban studies Dance personnel are often needed in community and professional theater, private dance studios, summer camps, artist-in-school programs, recreational centers, and universities.

General education modifications
F N 107 and H S 110 deleted as requirements
10 credits required in humanities
9 credits required in biological and physical sciences, mathematics
2 credits required in health, safety, physical education, and dance

Physical education core modifications
Dance 270 and 360 may be substituted for the P E 270 and 260 requirements
25 Required dance courses
1 Rhythmic Aspects of Movement — P E 187
1 Modern Dance I — Dance 120
1 Modern Dance Composition I — Dance 220
1 Modern Dance II — Dance 222
2 Sound and Movement — Dance 320
2 Advanced Studies in Dance — Dance 370 or Independent Study — Dance 490
2 Teaching Dance Technique and Composition — Dance 386 or Teaching Children's Dance — P E 384
14 Select a minimum of 16 credits from dance courses numbered 115-490
12 Area of specialization
Area and program must be approved by the Department of Physical Education.

31 Electives
College of Engineering

David R. Boylan, Dean
Paul E. Morgan, Associate Dean for Academic Affairs
Paul W. Peterson, Associate Dean for Research
Paul W. Barcus, Assistant Dean
Rolland C. Knight, Assistant to the Dean
George K. Serovy, Assistant to the Dean

Departments of the College

Aerospace Engineering
Agricultural Engineering
Chemical Engineering
Civil Engineering
Electrical Engineering
Engineering Science and Mechanics
Freshman Engineering
Industrial Engineering
Materials Science and Engineering
Mechanical Engineering
Nuclear Engineering

The engineer occupies a uniquely important position in our modern civilization. He or she has the responsibility for taking the discoveries of basic science and translating them into products, structures, facilities, and services for the use of mankind.

Objectives of Curricula in Engineering

The broad objectives of engineering education are to develop professional competence and, by breadth of study, to prepare students for participation as leaders in the affairs of their professions, their communities, the state, and the nation. Engineering education seeks to develop a capacity for objective and analytical thought.

The curricula in engineering provide a balanced program in mathematics, basic sciences, engineering sciences, design, social sciences, and humanities. This content is consistent with recommendations of the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET), the national engineering accrediting agency.

Registration as a professional engineer, which is granted by the individual states, is required for many types of positions. The professional curricula in engineering at Iowa State University are designed to prepare a graduate for subsequent registration in all states. Seniors in EAC/ABET accredited curricula of the College of Engineering may take the Fundamentals Examination for professional registration during their final academic year. Seniors in the surveying curriculum and seniors in other engineering curricula who have obtained at least 14 semester credits in surveying may take the Fundamentals Examination for professional registration as land surveyors.

Advanced work in engineering is offered in the post-graduate programs. See the Graduate College section of this catalog.

Organization of Curricula

All curricula in engineering are divided into two phases: a basic program and a professional program. The basic program consists primarily of subjects fundamental and common to all branches of engineering and includes chemistry, physics, mathematics, engineering graphics, engineering computations, and English. A student who has adequate high school preparation is expected to complete the basic program in one year. The professional phase of a curriculum includes intensive study in the particular branch of engineering which a student chooses, as well as a continuation of supporting work in mathematics, basic sciences, humanities, and social sciences.

Preparation for the Engineering Curricula

Recommended preparation for students entering the College of Engineering is 2 years of algebra, 1 year of geometry, 1/2 year of trigonometry, as well as a year each of physics and chemistry. Without this background in mathematics and science, it may take longer than 4 years to earn a degree in engineering. Students must complete the requirements of the basic program before proceeding to the professional engineering curriculum of their choice.

Basic Program for Professional Engineering Curricula

The first year program is much the same for all professional curricula in the College of Engineering. Each curriculum requires completion of the basic program as well as the curriculum designated requirements. The basic program is a set of core courses common to all engineering curricula, while the curriculum designated requirements are courses required by individual curricula. Because of the curriculum designated requirements, there are some differences among curricula. The student who desires to receive the bachelor's degree in a minimum time will find it desirable to select a curriculum as soon as possible.

Basic Program

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>8 or 10</td>
<td>Mathematics 165, 166 or 175, 176</td>
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<td>6</td>
<td>English 104, 105</td>
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<td>4</td>
<td>Freshman Engineering 155, 156</td>
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<tr>
<td>4</td>
<td>Chemistry 167 or 177</td>
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<tr>
<td>5</td>
<td>Physics 221</td>
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<tr>
<td>0.5</td>
<td>Library 160</td>
</tr>
<tr>
<td>28.5 or 30.5</td>
<td>Total credits</td>
</tr>
</tbody>
</table>

See below table for detailed curriculum information.
Students who are not adequately prepared may have to take Math 140, 141, 142 and/or Chem 50 in addition to the courses listed above. Neither Math 140, 141, 142 nor Chem 50 may be used to satisfy credit requirements for graduation in any of the engineering curricula.

**Freshman Engineering 102 is also required for undeclared students.**

### Curriculum Designated Requirements

- **Aerospace Engineering — Fr E 155L, Aer E 101**
- **Agricultural Engineering — Chem 167L, Fr E 155L, Agron 154, A E 110**
- **Civil Engineering — Chem 167L, Sociohumanistic elective (3 cr.)**
- **Chemical Engineering — Chem 177L, 178, 178L**
- **Computer Engineering — Chem 167L, Com S 172**
- **Computer Engineering — Com S 111, 112**
- **Construction Engineering — Econ 201, Psych 101, Con E 100**
- **Electrical Engineering — Con S 111, Sociohumanistic elective (3 cr.)**
- **Engineering Operations — Psych 101, IE 100**
- **Engineering Science — Chem 167L, Com S 172, Sociohumanistic elective (2 cr.)**
- **Industrial Engineering — Psych 101, IE 100**
- **Mechanical Engineering — Chem 167L, Fr E 155L**
- **Metallurgical Engineering — Chem 167L, MSE 101**
- **Nuclear Engineering — Com S 172, Sociohumanistic elective (3 cr.), Nuc E 100**
- **Surveying — Sociohumanistic elective (3 cr.)**

The student's advisor may require or recommend courses in addition to those specified above if the preparation and progress of the student are such that additional courses are necessary or desirable.

### Requirement for Entry into Professional Program

Students enrolled in the College of Engineering must satisfy both of the following requirements before being admitted to a professional program:

1. Completion of the basic program with an average of 2.00 or better in the basic program
2. A cumulative grade average of 2.00 or better for all courses taken at Iowa State up to that time

Engineering undergraduates must be admitted to a professional program before they may enroll in 200-level or above courses offered in the College of Engineering. The only exceptions to the application of this rule are the following:

- Students who completed all of their course work while enrolled in the College of Engineering, but have not been admitted to a professional program may enroll in 200-level or above courses offered in the College of Engineering for not more than one semester.
- Students transferring to the College of Engineering from another school or another program outside this college who do not qualify for admission to a professional program may enroll in 200-level or above courses offered in the College of Engineering for not more than two semesters.
- Iowa State students not pursuing an engineering degree may take engineering courses without restrictions provided they meet the prerequisites.
- Only the first two semesters of 200-level and above engineering courses, taken while a student is not admitted to a professional engineering program, can be applied toward an engineering degree.

Students reentering the College of Engineering must have the approval of the College Academic Standards Committee.

### Advising System

The purpose of the advising system in the College of Engineering is to work constructively with students in developing their individual academic program and to maintain close contact with students during their college career.

The college also offers an orientation program during the summer for students planning to enter in the fall. All prospective students are encouraged to attend a one-day orientation session. Tests given at this time help determine the student's level of achievement and enable the adviser to prepare an appropriate fall quarter program for the student.

### Special Programs

Engineering College students may participate in the following undergraduate programs. These programs are integrated into the professional engineering curricula and often require additional work. Each individual program is developed by the student and his/her engineering adviser.

#### a. Cooperative Education Program — The College of Engineering offers, through its curricula, cooperative programs in which students may gain practical experience in engineering during college years.

These programs are arranged so that the academic work is taught at the University and practical experience is gained by working in industry during certain periods each year. The student under a cooperative program receives experience in a chosen profession, plus financial return.

The employer can evaluate the student's potential as a possible future permanent employee. The college gains by the engineering experiences which the cooperative student brings into the classroom.

In general, students under these programs will require one year more to complete the usual curriculum requirements. The first contact with industry usually comes after completion of the first or second year. The college does not guarantee the kind of work or wages, but attempts to place students to their best educational and financial advantages.

A student must observe regulations of the employer and must not expect special treatment. University holidays do not apply to cooperative students, nor are students allowed time off for University activities. A student may not enroll in classes at any educational institution during a period of cooperative employment without University approval.

Those in the cooperative program are considered by the University to be students while they are employed. Such students are subject to University regulations concerning conduct during this period and are liable to dismissal from the University for misconduct on the job. They may continue living in University housing during work periods.

Cooperative students pay no fees to the University during work periods but may attend student activities provided they pay the activity fee.

#### b. Engineering Journalism Program. See Index, also see Engineering Operations.

#### c. Environmental Studies Program. See Index.

### Professional Program

#### Sophomore Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
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<tbody>
<tr>
<td></td>
<td>4 Elementery Multivariable Calculus — Math 265</td>
</tr>
<tr>
<td></td>
<td>5 Introduction to Classical Physics II — Phys 222</td>
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<tr>
<td>3</td>
<td>Statistics of Engineering — E M 274</td>
</tr>
<tr>
<td>3</td>
<td>Aerodynamics I — Aer E 241</td>
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<tr>
<td>3</td>
<td>Sociohumanistic elective*</td>
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**Spring**

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
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<tbody>
<tr>
<td>4</td>
<td>Elementary Differential Equations and Laplace Transforms — Math 267</td>
</tr>
<tr>
<td>3</td>
<td>Mechanics of Materials — E M 324</td>
</tr>
<tr>
<td>3</td>
<td>Dynamics — E M 345</td>
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<tr>
<td>3</td>
<td>Aerodynamics II — Aer E 242</td>
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<td>3</td>
<td>Aerospace Laboratory I — Aer E 271</td>
</tr>
<tr>
<td>3</td>
<td>Sociohumanistic elective*</td>
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**Junior Year**

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<th>Cr.</th>
<th>Fall</th>
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<tbody>
<tr>
<td>3</td>
<td>Aerodynamic Theory I — Aer E 341</td>
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<tr>
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<td>Astrodynamics I — Aer E 351</td>
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<td>Aerospace Laboratory II — Aer E 371</td>
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<tr>
<td>3</td>
<td>Engineering Thermodynamics I — M E 331</td>
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<tr>
<td>3</td>
<td>Materials for Aerospace Applications — M S E 371</td>
</tr>
<tr>
<td>3</td>
<td>Introduction to Circuits, Instruments, and Electronics — E E 441</td>
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**Spring**

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
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<tbody>
<tr>
<td>3</td>
<td>Aerodynamic Theory II — Aer E 342</td>
</tr>
<tr>
<td>3</td>
<td>Flight Structures Analysis — Aer E 321</td>
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<tr>
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<td>Flight Vehicle Stability and Control — Aer E 355</td>
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<td>2</td>
<td>Aerospace Laboratory III — Aer E 372</td>
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<tr>
<td>3</td>
<td>Mathematics elective***</td>
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<td>Sociohumanistic elective*</td>
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<tr>
<td>17</td>
<td>Inspection Trip — Aer E 300</td>
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**Senior Year**

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<th>Cr.</th>
<th>Fall</th>
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<tr>
<td>3</td>
<td>Aerospace Vehicle Propulsion I — Aer E 411</td>
</tr>
<tr>
<td>3</td>
<td>Advanced Flight Structures — Aer E 421</td>
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<tr>
<td>3</td>
<td>Flight Control Systems I — Aer E 431</td>
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<tr>
<td>3</td>
<td>Design and Analysis I — Aer E 461</td>
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<td>1</td>
<td>Senior Projects — Aer E 471</td>
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<tr>
<td>3</td>
<td>Aerospace Seminar — Aer E 491</td>
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<tr>
<td>3</td>
<td>Sociohumanistic elective*</td>
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<td>16</td>
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</table>

## Curriculum in Aerospace Engineering

Leading to the degree Bachelor of Science Total credits required: 133.5. See also Basic Program and Cooperative Programs.

### Professional Program

#### Sophomore Year

<table>
<thead>
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<th>Cr.</th>
<th>Fall</th>
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<tr>
<td>4</td>
<td>Elementary Multivariable Calculus — Math 265</td>
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**Spring**

<table>
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</tr>
</tbody>
</table>
Curriculum in Agricultural Engineering

With options in electric power and processing, agricultural power and machinery, structures and environment, soil and water control, and food engineering. Administered jointly by the College of Agriculture and the College of Engineering.

Leading to the degree Bachelor of Science.
Total credits required: 130.5
See also Basic Program and Cooperative Programs.

Sophomore Year
Cr. Fall
4 Agricultural Engineering Concepts I — A E 201
3 Statics of Engineering — E M 274
4 Elementary Multivariable Calculus — Math 265
5 Introduction to Classical Physics II — Phys 222

Spring
4 Agricultural Engineering Concepts II — A E 202
3 Elementary Differential Equations — Math 266
3 Strength of Materials — E M 324
4 Principles of Economics — Econ 201
3 Fundamentals of Botany — Bot 307

Junior Year
Cr. Fall
4 Introduction to Circuits, Electronics and Instruments — E E 441
1 Mechanics of Materials Lab — E M 327
3 Thermodynamics — M E 330
6 Option or agricultural engineering electives**
3 Materials Engineering with Applications in A E — A E 359
R Seminar — A E 302

Curriculum in Ceramic Engineering

Administered by the Department of Materials Science and Engineering. Leading to the degree Bachelor of Science. Total credits required: 129.5. See also Basic Program.

Professional Program

Sophomore Year
Cr. Fall
5 Introduction to Ceramic Engineering — M S E 230
5 Introduction to Classical Physics II — Phys 222
4 Elementary Multivariable Calculus — Math 265
2 Computer Programming in FORTRAN — Com S 172

Spring
6 Option or agricultural engineering electives**
3 Mechanics of Fluids — E M 378
3 Fundamentals of Speech Communication — Sp 211
3 Sociohumanistic elective*
2 Introduction to Statistics — Stat 105

Senior Year
Cr. Fall
9 Option or agricultural engineering electives**
R Seminar — A E 401
1 American Government — Pol S 215
3 Sociohumanistic elective*

Spring
12 Option or agricultural engineering electives**
3 Sociohumanistic elective*

Curricular sequences are to be chosen from the department-approved list.
**In the junior and senior years, each student elects one of the options and takes the courses listed for the selected option. In addition, each student must select a minimum of 6 credits of agricultural engineering electives from the other three options. At least one course must be selected in each of the other three options. This list of agricultural engineering electives includes: 342, 371, 421, 422, 426, 443, 447, 463, 471, 472.

Options:
Electric Power Processing — A E 463, 469; M E 330, 341, E M 345; 4 credits in E E selected with advisor; 5 credits of technical electives
Agricultural Power and Machinery — A E 342, 443, 444, 447, M E 310, 312, 321; E M 345, 417 or M E 322.
Structures and Environment — A E 371, 471, 472; C E 332, 334; M E 336, 441; E M 345; 2 credits of technical electives.
Soil and Water Control — A E 421, 422; C E 212, 332, 334, 360, 371; 3 credits of technical electives.

Junior Year
Cr. Fall
3 High Temperature Technology — M S E 330
3 Thermochromy for Materials Science and Engineering — M S E 345
3 Principles of Economics — Econ 201
3 Sociohumanistic elective*

Spring
4 Instruments for Materials Characterization — M S E 344
4 High Temperature Processes — M S E 345
3 Writing of Professional Papers and Reports — Engl 414
3 Electronic Ceramics — M E 343
3 Technical elective***
3 Materials Engineering with Applications — M S E 341
3 Free elective

Curricular sequences are to be chosen from the department-approved list.
**A minimum of 6 credits selected from E E 441, 445, 447, 449, Chem E 444, Cpr E 340, or 440.
***Technical electives must be department approved.
Curriculum in Chemical Engineering

Leading to the degree Bachelor of Science.
Total credits required: 129.5
See also Basic Program and Cooperative Programs.

Professional Program

Sophomore Year

Cr. Fall
R Seminar — Ch E 201
1 Material and Energy Balances — Ch E 210
4 Elementary Multivariable Calculus — Math 265
5 Introduction to Classical Physics II — Phys 222
2 Computer Programming in FORTRAN — Comp Sci 172

15

Spring
R Seminar — Ch E 202
3 Momentum Transport Operations — Ch E 320
1 Chemical Engineering Laboratory I — Ch E 324
4 Elementary Differential Equations and Laplace Transforms — Math 267
3 Physical Chemistry — Chem 321
4 Fundamentals of Mechanics — E M 301

16

Junior Year

Cr. Fall
R Seminar — Ch E 301
3 Heat and Mass Transfer — Ch E 321
4 Chemical Engineering Thermodynamics — Ch E 331
3 Physical Chemistry — Chem 322
3 Organic Chemistry — Chem 331
3 Sociohumanistic elective*

16

Spring
R Seminar — Ch E 302
4 Mass Transfer Operations — Ch E 322
1 Chemical Engineering Laboratory II — Ch E 325
3 Chemical Reactor Design — Ch E 332
3 Organic Chemistry — Chem 332
3 Sociohumanistic electives*

17

Senior Year

Cr. Fall
R Seminar — Ch E 401
1 Chemical Engineering Laboratory III — Ch E 426
4 Process and Plant Design — Ch E 430
3 Chemical engineering elective**
3 Writing of Professional Papers and Reports — Eng 414
3 Sociohumanistic elective*
3 Elective

17

*Selected from list of department approved courses.
**Selected from non-required chemical engineering courses that are open to undergraduates.

Curriculum in Civil Engineering

Leading to the degree Bachelor of Science.
Total credits required: 132.5
See also Basic Program and Cooperative Programs.

For those interested in construction engineering or surveying, curricula are provided which lead to the degree Bachelor of Science in construction engineering or the Bachelor of Science in surveying. For particulars, see Curriculum in Construction Engineering or Curriculum in Surveying.

Sophomore Year

Cr. Fall
4 Elementary Multivariable Calculus — Math 265
5 Introduction to Classical Physics II — Phys 222
3 Statics of Engineering — E M 274
2 Fundamentals of Surveying — Stat 105
1 The Practice of Engineering in Government — C E 295**

17-18

Spring
3 Advanced Engineering Surveying — Ch E 213
1 Mechanics of Materials — E M 324
1 Mechanics of Materials Laboratory — E M 327
1 Computer Programming in FORTRAN — Comp Sci 172

14-15

Junior Year

Cr. Fall
3 Structural Analysis I — C E 332
3 Mechanics of Fluids — E M 378
4 Soil Engineering — C E 360
3 Engineering Construction — C E 465
3 Sociohumanistic elective*

16

Spring
3 Structural Steel and Timber Design I — C E 333
3 Introduction to Transportation Engineering — C E 351
2 Design of Concretes and Pavements — C E 362
3 Engineering Hydrology — C E 371
3 Designated engineering science elective*
3 Sociohumanistic elective*

17

Senior Year

Cr. Fall
3 Reinforced Concrete Design I — C E 334
4 Municipal Water and Wastewater Engineering — C E 426
3 Highway Design — C E 452
8 Electives*

18

Spring
3 Construction or management elective*
8 Electives*

18

**C E 295 or 296 required, but not both.

Curriculum in Computer Engineering

Administered by the Department of Electrical Engineering

Leading to the degree Bachelor of Science
Total credits required: 130.5
See also Basic Program and Cooperative Programs

Sophomore Year

Cr. Fall
3 Introduction to Digital Techniques — Cpr E 280
3 Electric Circuits I — E E 205
2 Electrical Instrumentation and Experimentation — E E 235
4 Elementary Multivariable Calculus — Math 265
5 Introduction to Classical Physics II — Phys 222

17
### Curriculum in Construction Engineering

Administered by the Department of Civil Engineering.

Leading to the degree Bachelor of Science. Total credits required: 131 (132 in heavy construction, 133 in mechanical construction)

See also Basic Program and Cooperative Programs.

#### Sophomore Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Technical electives** 3  Elective***</td>
<td>8  Technical electives** 3  Elective***</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>6  Sociohumanistic electives*</td>
</tr>
</tbody>
</table>

**Sociohumanistic electives must be chosen from a list of sequences approved by the department.**

**Technical electives are of three types: (1) mathematics and statistics, (2) computer engineering, computer science and electrical engineering, and (3) other engineering and science courses. All technical electives must be chosen from lists of courses approved by the department. At least one course must be chosen from the mathematics and statistics list. The distribution of the remaining courses must comply with departmental rules.**

***The only restriction on these electives is that they cannot be remedial.***

#### Junior Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Professional Development — Con E 400 3  Business-management elective** 3  Sociohumanistic elective**</td>
<td>3  Construction Planning, Scheduling and Control — Con E 441 3  Business Communication — Eng'1 302 3  Sociohumanistic elective**</td>
</tr>
<tr>
<td>14-16</td>
<td>14-16</td>
<td></td>
</tr>
</tbody>
</table>

**Courses for professional elective credits are designated by the following course groupings in accordance with the construction emphasis chosen by the student. Building construction — C E 215, 332, 333, 334, 360;**

### Curriculum in Electrical Engineering

Leading to the degree bachelor of science. Total credits required: 133.5.

See also Basic Program and Cooperative Programs.

#### Sophomore Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Language Proficiency Laboratory — Com S 200</td>
<td>3  Electrical Circuits I — E E 205 2  Electrical Instrumentation and Experimentation — E E 235</td>
</tr>
<tr>
<td>2</td>
<td>3  Elementary Electromagnetics I — E E 206</td>
<td>4  Elementary Multivariable Calculus — Math 265</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>5  Introduction to Classical Physics II — Phys 222</td>
</tr>
<tr>
<td>3</td>
<td>3  Sociohumanistic elective*</td>
<td>3  Sociohumanistic elective*</td>
</tr>
<tr>
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<td>18</td>
</tr>
</tbody>
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#### Junior Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Elementary Electromagnetics II — E E 313</td>
<td>3  Electromagnetic Devices and Electric Machinery — E E 351</td>
</tr>
<tr>
<td>4</td>
<td>3  Electronics II — E E 331</td>
<td>4  Fundamentals of Mechanics — E M 301</td>
</tr>
<tr>
<td>3</td>
<td>3  Introduction to Partial Differential Equations — Math 385</td>
<td>3  Sociohumanistic elective*</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>18</td>
</tr>
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</table>

#### Senior Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Elementary Modern Physics — Phys 324</td>
<td>3  Technical electives**</td>
</tr>
<tr>
<td>3</td>
<td>3  Sociohumanistic elective*</td>
<td></td>
</tr>
</tbody>
</table>
Curriculum in Engineering Operations

Administered by the Department of Industrial Engineering.

Leading to the degree Bachelor of Science
Total credits required: 123.5. See also Cooperative Program.

In this era of rapid technological change, there is an expanding and continually accelerating need for persons with an engineering background. The need for people with a strong technological base to fill positions requiring managerial and supervisory requirements is ever-increasing in industry and government. Engineering operations is specifically designed to develop this background within several engineering disciplines, or in combination with engineering and other disciplines.

The curriculum consists of a basic core of required courses in the sciences, engineering, and management to which are added 61 credits of elective courses in the specific categories of engineering, sociohumanistics, management, and preliminary supporting subjects. Within this framework, students may specialize toward specific occupational objectives of their choice. Many students choose to work toward the specializations indicated below.

Prior to entering the engineering operations program the student must have completed the basic program and have presented a description of the vocational objective to be achieved through the program to the department chairman for approval. In addition, the student will submit a schedule of courses to support this objective.

Specializations

Biomedical — Provides the background for study in biomedical engineering.

Economy and Valuation — Study of the value of property and related economic analyses in the management of capital invested in plant and equipment.


Operations Research — Development of mathematical concepts and models concerned with decision making in engineering and management.

Prelaw — Preparation for study in corporate or patent law.

Premedical — Provides background for study in human medicine.

Technical Sales — Provides a background for selling products of a technical nature and solving engineering problems which may arise following such sales.

Special Programs

To meet special needs, programs are available in the following (see index):

Program in International Studies.
Program in Engineering Journalism
Program in Engineering for Officer Education

Required Courses

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Basic sciences</th>
</tr>
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<tbody>
<tr>
<td>12</td>
<td>Math 165, 166, 265</td>
</tr>
<tr>
<td>4</td>
<td>Chem 167</td>
</tr>
<tr>
<td>10</td>
<td>Phys 221, 222</td>
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<td>Total</td>
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Sociohumanistic courses

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Sociohumanistic courses</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>Psych 101</td>
</tr>
<tr>
<td>4</td>
<td>Econ 201</td>
</tr>
<tr>
<td>7</td>
<td>Total</td>
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</table>

Communication skills

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Communication skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Fr E 165</td>
</tr>
<tr>
<td>6</td>
<td>Engl 104, 105</td>
</tr>
<tr>
<td>6</td>
<td>Sp 211, Engl 414</td>
</tr>
<tr>
<td>15</td>
<td>Total</td>
</tr>
</tbody>
</table>

Miscellaneous

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Miscellaneous</th>
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<tr>
<td>2.5</td>
<td>Fr E 155, Lib 160</td>
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<tr>
<td>3</td>
<td>I E 480 or Mgmt 315</td>
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<tr>
<td>4</td>
<td>Com S 172, Acc 501</td>
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<tr>
<td>2</td>
<td>I E 250</td>
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<tr>
<td>1</td>
<td>Fr E 101</td>
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<tr>
<td>1</td>
<td>I E 393</td>
</tr>
<tr>
<td>3</td>
<td>E Op 291</td>
</tr>
<tr>
<td>11.5</td>
<td>Total</td>
</tr>
</tbody>
</table>

Group Requirements

Course combinations for each student should be integrated toward a vocational objective. Each student's choice of courses in the following groups must be approved in advance by the head of the Department of Industrial Engineering.

Cr.

12 Engineering science: engineering mechanics, 6; electrical engineering, 4, measurements, 2

18 Engineering Analysis (300 level or above)

11 Supporting work (basic and engineering sciences)

10 Management, production, business or sales courses (300 level or above, principally in business administration or industrial engineering)

10 Sociohumanistic sequences

Curriculum in Engineering Science

Administered by the Department of Engineering Science and Mechanics.

Leading to the degree Bachelor of Science.
Total credits required: 133.5.
See also Basic Program and Cooperative Programs.

Sophomore Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Elementary Multivariable Calculus — Math 265</td>
</tr>
<tr>
<td>5</td>
<td>Introduction to Classical Physics I — Phys 222</td>
</tr>
<tr>
<td>2</td>
<td>Introduction to Statistics — Stat 105</td>
</tr>
<tr>
<td>3</td>
<td>Statics of Engineering — E M 274</td>
</tr>
<tr>
<td>3</td>
<td>Electric Circuits I — E E 205**</td>
</tr>
<tr>
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Spring

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Elementary Differential Equations and Laplace Transforms — Math 267</td>
</tr>
<tr>
<td>3</td>
<td>Basic Engineering Design I — E Sci 380</td>
</tr>
<tr>
<td>3</td>
<td>Mechanics of Materials — E M 324</td>
</tr>
<tr>
<td>1</td>
<td>Mechanics of Materials Laboratory — E M 327</td>
</tr>
<tr>
<td>2</td>
<td>Electrical Instrumentation and Experimentation — E E 235**</td>
</tr>
<tr>
<td>3</td>
<td>Sociohumanistic elective*</td>
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<tr>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Introduction to Partial Differential Equations — Math 385</td>
</tr>
<tr>
<td>4</td>
<td>Engineering Materials — E Sci 351</td>
</tr>
<tr>
<td>4</td>
<td>Dynamics — E M 345</td>
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<tr>
<td>4</td>
<td>Electronics I — E E 330**</td>
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<tr>
<td>3</td>
<td>Sociohumanistic elective*</td>
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</table>

Spring

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Engineering Materials — E Sci 352</td>
</tr>
<tr>
<td>3</td>
<td>Basic Engineering Design II — E Sci 380</td>
</tr>
<tr>
<td>3</td>
<td>Mechanics of Fluids — E M 378</td>
</tr>
<tr>
<td>4</td>
<td>Engineering Thermodynamics I — E M 331</td>
</tr>
<tr>
<td>3</td>
<td>Elective***</td>
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<tr>
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</table>

Senior Year

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Advanced Analysis and Design — E Sci 481</td>
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<tr>
<td>3</td>
<td>Mechanical Vibrations — E M 444</td>
</tr>
<tr>
<td>3</td>
<td>Elements of Heat Transfer — M E 436</td>
</tr>
<tr>
<td>3</td>
<td>Writing of Professional Papers and Reports — Engl 414</td>
</tr>
<tr>
<td>R</td>
<td>Seminar — E Sci 401</td>
</tr>
<tr>
<td>3</td>
<td>Elective***</td>
</tr>
<tr>
<td>2</td>
<td>Sociohumanistic elective*</td>
</tr>
<tr>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

Spring

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Advanced Analysis and Design — E Sci 482</td>
</tr>
<tr>
<td>3</td>
<td>Energy Sources and Utilization — E Sci 412</td>
</tr>
<tr>
<td>R</td>
<td>Seminar — E Sci 402</td>
</tr>
<tr>
<td>6</td>
<td>Electives**</td>
</tr>
<tr>
<td>4</td>
<td>Sociohumanistic elective*</td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

*These electives are to be chosen from the department-approved list of sociohumanistic sequences.
**E E 441, 445, 447 may be substituted for E E 205, 235, 330.
***Each student will be required to have on file an approved plan for elective courses before precollision for spring semester of the junior year.

The electives in the program may not be used for remedial work. ROTC courses may be used to satisfy any of the 12 elective credits by students admitted to advanced ROTC.

Curriculum in Engineering Operations

Administered by the Department of Industrial Engineering.

Leading to the degree Bachelor of Science.
Total credits required: 123.5.
See also Basic Program and Cooperative Programs.
**Curriculum in Industrial Engineering**

Leading to the degree Bachelor of Science. Total credits required: 129.5. See also Basic Program and Cooperative Programs.

| Sophomore Year |  |
|----------------|-----------------
| Cr. Fall       |  |
| 4 Elementary Multivariable Calculus — Math 265 |  |
| 5 Introduction to Classical Physics II — Phys 222 |  |
| 3 Fundamentals of Speech Communication — Sp 211 |  |
| 2 Computer Programming in FORTRAN — Com S 172 |  |
| 2 Introduction to Industrial Engineering — I E 250 |  |

16

| Spring         |  |
|----------------|-----------------
| 3 Elementary Multivariable Calculus — Math 266 |  |
| 4 Principles of Economics — Econ 201 |  |
| 4 Probability and Statistical Inference for Engineers — Stat 231 |  |
| 2 Industrial Accounting — Acct 381 |  |
| 3 Industrial Computer Techniques — I E 209 |  |
| R Seminar — I E 293 |  |

16

| Junior Year    |  |
|----------------|-----------------
| Cr. Fall       |  |
| 3 Materials Science and Engineering — M S E 271 |  |
| 3 Engineering mechanics elective* |  |
| 2 Ergonomics in Work System Design — I E 274 |  |
| 4 Industrial Operations Research — I E 312 |  |
| 3 Methods Engineering and Work Measurement — I E 373 |  |

15

| Spring         |  |
|----------------|-----------------
| 3 Industrial Quality Control and Inspection — I E 361 |  |
| 2 Industrial Methodology — I E 374 |  |
| 3 Engineering Economy — I E 404 |  |
| 2 Human Resource Management — I E 424 |  |
| 4 Electrical engineering elective* |  |
| 3 Engineering mechanics elective* |  |
| R Industrial Inspection Trip — I E 393 |  |

17

| Senior Year    |  |
|----------------|-----------------
| Cr. Fall       |  |
| 5 Industrial Engineering Design — I E 441 |  |
| 3 Material and Project Control — I E 341 |  |
| 3 Thermodynamics — M E 330 |  |
| 6 Industrial engineering electives* |  |
| R Professional Development — I E 491 |  |

17

| Spring         |  |
|----------------|-----------------
| 3 Writing of Professional Papers and Reports — Eng 414 |  |
| 2 Industrial engineering elective* |  |
| 6 Engineering science electives* |  |
| 6 Sociohumanistic electives* |  |

17

**These electives are to be chosen from department authorized lists with advanced approval.**

---

**Curriculum in Mechanical Engineering**

Leading to the degree Bachelor of Science. Total credits required: 127.5. See also Basic Program and Cooperative Programs.

| Sophomore Year |  |
|----------------|-----------------
| Cr. Fall       |  |
| 4 Elementary Multivariable Calculus — Math 265 |  |
| 5 Introduction to Classical Physics II — Phys 222 |  |
| 1 Laboratory Survey of Classical Physics — Phys 224 |  |
| 3 Statics of Engineering — E M 274 |  |
| 2 Introduction to Principles of Macro-Economics — Econ 203 |  |

15

| Spring         |  |
|----------------|-----------------
| 4 Elementary Differential Equations and Laplace Transforms — Math 267 |  |
| 3 Dynamics — E M 345 |  |
| 3 Mechanics of Materials — E M 324 |  |
| 2 Principles of Materials Science — M S E 270 |  |
| 3 Introduction to Mechanical Engineering — M E 253 |  |
| R Industrial Inspection — M E 201 |  |

15

| Junior Year    |  |
|----------------|-----------------
| Cr. Fall       |  |
| 3 Mechanisms — M E 310 |  |
| 3 Mechanical Behavior of Materials — M E 321 |  |
| 4 Engineering Thermodynamics I — M E 331 |  |
| 4 Introduction to Circuits, Instruments and Electronics — E E 441 |  |
| 3 Sociohumanistic elective* |  |

17

| Spring         |  |
|----------------|-----------------
| 3 Mechanical Systems — M E 311 |  |
| 3 Manufacturing Processes — M E 322 |  |
| 3 Engineering Thermodynamics II — M E 332 |  |
| 3 Fluid Flow — M E 335 |  |
| 2 Introduction to Electric Machinery — E E 447 |  |
| 3 Sociohumanistic elective* |  |
| R Mechanical Engineering Seminar — M E 301 |  |

17

| Senior Year    |  |
|----------------|-----------------
| Cr. Fall       |  |
| 3 Design of Machine Elements — M E 312 |  |
| 3 Engineering Measurements and Instrumentation — M E 360 |  |
| 3 Heat Transfer — M E 436 |  |
| 2 Sociohumanistic elective* |  |
| 6 Technical electives** |  |

17

---

**Curriculum in Metallurgical Engineering**

Administered by the Department of Materials Science and Engineering. Leading to the degree Bachelor of Science. Total credits required: 127.5. See also Basic Program.

| Professional Program |  |
|----------------------|-----------------
| Sophomore Year       |  |
| Cr. Fall             |  |
| 2 Principles of Materials Science — M S E 270 |  |
| 2 Introductory Physical Metallurgy Lab — M S E 270L |  |
| 5 Introduction to Classical Physics II — Phys 222 |  |
| 4 Elementary Multivariable Calculus — Math 267 |  |
| 3 Statics of Engineering — E M 274 |  |

16

| Spring             |  |
|--------------------|-----------------
| 3 Introduction to Metallurgical Engineering — M S E 203 |  |
| 3 Elementary Differential Equations — Math 266 |  |
| 3 Mechanics of Materials — E M 324 |  |
| 4 Sociohumanistic elective* |  |
| R Free elective     |  |

16

| Junior Year        |  |
|--------------------|-----------------
| Cr. Fall           |  |
| 3 Thermochrometry for Materials Science and Engineering — M S E 360 |  |
| 4 Physical Metallurgy — M S E 301 |  |
| 2 Metallurgy Laboratory — M S E 301L |  |
| 3 Electricity and electronics elective* |  |
| 4 Sociohumanistic elective* |  |

16
Curriculum in Nuclear Engineering

Leading to the degree Bachelor of Science
Total credits required: 130.5
See also Basic Program and Cooperative Programs.

Sophomore Year

Cr. Fall
4 Elementary Multivariable Calculus — Math 265
5 Introduction to Classical Physics II — Phys 222
3 Fundamentals of Nuclear Engineering — Nuc E 211
4 Principles of Economics — Econ 201
16

Spring
4 Elementary Differential Equations and Laplace Transforms — Math 267
3 Materials Science and Engineering — M S E 271
3 Radiation and Radioactivity — Nuc E 221
4 Fundamentals of Mechanics — E M 301
3 Fundamentals of Speech Communication — Sp 211
17

Junior Year

Cr. Fall
4 Fission Reactor Analysis — Nuc E 331
1 Laboratory in Reactor Analysis — Nuc E 331L
3 Nuclear Materials and Radiation Effects — M S E 375
4 Electives
17

Curriculum in Surveying

Administered by the Department of Civil Engineering

Leading to the degree Bachelor of Science
Total credits required: 130.5
See also Basic Program and Cooperative Programs.

Sophomore Year

Cr. Fall
3 Fundamentals of Surveying — C E 212
3 Cartography — C E 301
5 Introduction to Classical Physics II — Phys 222
4 Fundamentals of Mechanics — E M 301
2 Introduction to Statistics — Stat 105
17

Spring
3 Advanced Engineering Surveying — C E 213
1 Mechanics of Materials Laboratory — E M 327
4 Electives
17

Junior Year

Cr. Fall
2 Geodetic Control Systems — C E 315
3 Engineering Hydrology — C E 371
2 Geology for Engineers — Geol 301
3 Theory of Matrices — Math 307
2 Analysis for Engineering Economy — I E 304
4 Elective
16

Spring
2 General Photogrammetry and Photointerpretation — C E 414
2 Land Surveying — C E 317
3 Computer Graphics — I E 333
3 Landforms — Geol 377
3 Planning Analysis and Techniques — C R P 272
3 Elective
16

Senior Year

Cr. Fall
9 Electives
17

Spring
2 Survey Computation and Design — C E 412
2 Independent Study (Senior Project) — C E 490
3 Writing of Professional Reports and Papers — Engl 414
9 Electives
16

* These electives are to be chosen from the department-approved list of sociohumanistic courses.
**This elective is to be chosen from the department-approved list of business management courses.
***This elective is to be chosen from the department-approved list of technical courses.

*These electives shall include (1) 9 credits of sociohumanistic electives from a curriculum-approved list as above, and (2) 11 credits from a curriculum-approved list of technical and management electives.
College of Home Economics

Students interested in housing and interior furnishings could develop a program in Housing and the Near Environment or General Studies.

Cross Cultural Programs
Available in the Department of Home Economics Studies

Home Economics Extension
Students may prepare for a career in the Cooperative Extension Service by enrolling in any of the home economics curricula which provide them with a broad subject matter base for conducting educational programs for families. Courses should include Psych 333, H Ed 410, 413 and Ad Ed 489. Advice on choice of additional courses should be sought from the associate dean and state leader of home economics extension programs, the state 4-H and youth leader, or the coordinator of extension personnel training.

Home Economics Rehabilitation Emphasis
Programs with an emphasis in rehabilitation are available in the departments of Child Development, Family Environment, Food and Nutrition, and Home Economics Education. Supporting courses are available from the Textiles and Clothing Department. These programs combine coursework with a practical experience. Graduates are prepared for employment with public and private agencies serving the handicapped.

Honors Program
Superior students are encouraged to develop individualized programs of study consistent with educational objectives. Honors students participate in an honors project within the major area of study and are expected to maintain a grade point average above 3.35. For further information contact the College Honors Committee, academic adviser, or see index, Honors Program.

Recommended Preparation
Students will find it beneficial to have a high school background of at least 3 semesters of algebra, 1 year of chemistry, 1 year of biological science, and 4 years of English composition and rhetoric.

Advising System
Each student in the College of Home Economics has an academic adviser. Faculty members in the Department of Home Economics Studies advise all freshmen. Upperclass students are assigned faculty advisers in the departments of their chosen curriculum. Advisers assist students in making adjustments to the University and provide information and guidance on vocational choices. Assistance is given the students in scheduling course work in accordance with their interests and capabilities.

Planned Transfer Programs
The College of Home Economics has a specific program with Central College. By careful planning a student may take two years at Central College and two years at Iowa State University and complete degree requirements in four years in any of the curricula. Applications for admission to the transfer programs in home economics should be addressed to the Director of Admissions, Central College.

In addition, most community colleges have planned transfer programs with the College of Home Economics. Contact the Director of Admissions at these institutions for further information.

Prospective transfer students are urged to contact the College of Home Economics or the department of major interest regarding selection of appropriate courses transferable toward graduation. Selection of specific curricula may be delayed one semester following enrollment. Special orientation sessions are available for transfer students.

Preparation for Graduate Study
Students considering graduate school should gain background knowledge in basic subjects related to their area of interest. Undergraduate mathematics, statistics, and research methods courses are useful as preparation for advanced study in graduate school. Upon completion of graduate programs, students are qualified for responsible research positions in public and private institutions and for appointments that may involve teaching, research, and extension in colleges and universities.

Professional Opportunities In Home Economics
Placement of graduates remains at a high level. They are employed in education, business and industry, and by nonprofit and government organizations. Graduates may teach preschool and kindergarten children and/or preschool handicapped children, or teach home economics in public schools and through the extension service. Examples of opportunities in business and industry include: housing and furnishings consultant; management trainee; merchandising trainee; test laboratory home economist — food, textiles, equipment; writer; sales representative; and consumer product specialist. Health, social service, recreation organizations, and government agencies employ dietitians and other specialists for child, family, and consumer services. Usually the graduate's strength is in interpreting the products or services of the organization to families and consumers and in representing the interests of families and consumers within the organization. Students may plan a program to prepare for professional programs such as medicine or law while pursuing a B.S. degree.

Departments of the College

- Child Development
- Family Environment
- Food and Nutrition
- Home Economics Education
- Home Economics Studies
- Institution Management
- Textiles and Clothing

Curricula In Home Economics
The curricula are planned to meet a variety of academic interests, abilities, and goals of the student. Each curriculum requires depth in a discipline. Breadth is acquired through general education and careful use of electives.

- Adult Home Economics Education
- Apparel Design and Patternmaking
- Child, Parent, and Community Services
- Community Nutrition — Food and Nutrition
- Dietetics — Food and Nutrition
- Family Resource Management
- Family Services
- Fashion Merchandising
- Food Science — Food and Nutrition
- Foodservice Management
- General Studies in Home Economics
- Growth and Development of Children
- Home Economics Education
- Home Economics Journalism
- Hotel and Restaurant Management
- Housing and the Near Environment
- International Studies in Home Economics
- Nutritional Science — Food and Nutrition
- Teaching Prekindergarten-Kindergarten
- Children
- Textiles and Clothing Related Science

Open Option Status
The College of Home Economics offers an open option for entering students who have not selected a specific area of study. A one-credit orientation course, Home Economics 101, Introduction to Home Economics, is available to assist students explore the opportunities available. Program planning information can be obtained from academic advisers in the Department of Home Economics Studies.

Special Interest Programs
- Related Art and Home Economics
  Programs with related art emphases are available in the College of Home Economics
General Education
Each department within the college requires students to select and/or elect courses to fulfill a specific number of credits in prescribed areas.

Group Requirements in the College of Home Economics

Cr. 5 I Home economics* 9 II Natural sciences and mathematical disciplines 9 III Social sciences 9 IV Humanities 8 V Communications 0.5 VI Library instruction

*Assumes additional credits will be necessary for meeting the objectives of the College of Home Economics, including the areas of nutrition, management, and educational principles.

Curriculum in Adult Home Economics Education

Leading to the degree Bachelor of Science. Total credits required: 128.5.

This curriculum is designed for students interested in preparing for a variety of adult education programs in extension, area schools, and business.

Cr. 42-46 Degree Requirements

30 Home Economics C D 224; C D / F E 201; F E 240, 378, 488; F N 107, 208; HE St 101, 401; T C 121, 204

3 Select from C D 225, 226

3 Select from F E 354; HE St 210

3 Select from Mgt 380 and 380L; F N 303

2-3 Select from T C 165, 246

2-4 Select from F E 370 and 370L, 415; HE St 420

20 Professional Courses

H Ed 206, 408, 410, 411, 418, 420, 508; Psych 333, SecEd 301

39.5 General Education

9 Communications: Engl 104, 105; Sp 211

12-13 Art and Humanities*: Select from two areas: foreign language, history, literature, music, philosophy; select 3-4 from Art 101 and 102, 261

0.5 Library Instruction: Lib 160

11 Natural sciences and mathematical disciplines: Biol 109 or Zool 155; Chem 163, 163L, 231

10 Social sciences: Econ 201; Psych 230, Soc 134

1 Dance, health, physical education 20-22 Electives

128.5 Total credits

Curriculum in Apparel Design and Patternmaking

Administered by the Department of Textiles and Clothing, leading to the degree Bachelor of Science. Total credits required: 128.5.

The curriculum in apparel design and patternmaking is planned for those interested in the aesthetic aspects of textiles and clothing and in apparel design.

Cr. Degree Requirements

27 Textiles and clothing/home economics T C 121, 165, 204, 245, 275, 480; Art 101, 102; C D / F E 201; F N 107; HE St 101, 401

37-40 Professional courses

20-21 T C 222, 232, 304 or 404, 345, 355, 431

3 Select from T C 375, 464, 465, 468

9 T C 278, 279; Dsn S 140

5-7 Select from one of the following groups:

Art 243, 244, 247, 261, 346; HE St 210 or Art 203, 300, 350; HE St 330 or Sp 106, 250, 255, 356

General Education

13-15 Communications

8-9 Engl 104, 105; Sp 211 or 212

3 Select from Engl 302; Sp 151, 311, 312

2-3 Select from Jl MC 225, 325; Psych 250

9 Humanities: Art 280, 281; Hist 201

0.5 Library instruction: Lib 160

11 Natural sciences and mathematical disciplines

3 Select from Biol 109, 110; Zool 155

5 Chem 163, 163L

3 Select from Math 104, 140, 150

10 Social sciences: Econ 201; Psych 101; Soc 134

16-21 Electives

128.5 Total credits

Curriculum in Community Nutrition — Food and Nutrition

Leading to the degree Bachelor of Science. Total credits required: 128.5.

This curriculum provides basic preparation for students who desire employment with nutrition services of public health departments, social welfare agencies, commercial organizations, or extension. It meets academic requirements for admission to those dietetic internships which offer a specialization in community nutrition.

Cr. Degree Requirements

34 Food and nutrition F N 107, 214, 303, 305, 305L, 404, 410, 411, 413, 414, 431

10-11 Communications

Engl 104, 105; Sp 212; select from Engl 302, 414, or Jl MC 225

12 Home economics C D / F E 201; HE St 101, 401; Mgt 380, 380L, 438

9 Humanities

Select from foreign languages, history, literature, music, philosophy

0.5 Library instruction: Lib 160

31-32 Natural sciences and mathematical disciplines: B B 301, 311; Biol 110, 110L, Chern 163, 163L, 231, 2328, Micro 300, Stat 107 or 104, Zool 155, 156.
Curriculum in Dietetics — Food and Nutrition

Leading to the degree Bachelor of Science
Total credits required: 128.5.

This curriculum serves the interests of the student who wishes to prepare to work in the medical aspects of nutrition, including nutrition education, and in food service systems. Two options are available to the student wishing to major in dietetics.

I. Option In General and Clinical Dietetics

The student is prepared for admission to hospital and other dietetic internship programs. Courses included meet academic requirements of the American Dietetic Association for internships with a specialization in general and clinical dietetics.

Cr. Degree Requirements

30-31 Food and nutrition
F N 107, 214, 305, 305L, 404, 410, 411, 418, 430, 431
10-11 Communications
Engl 104, 105; Sp 211 or 212
18 Home economics
C D I F 201, HE St 101, 401; Mgt 380, 380L, 434, 435, 436, 438
9 Humanities
Select 3 credits from history, 6 credits from foreign languages, history, literature, music, philosophy
0.5 Library instruction
Lib 160
34-36 Natural sciences and mathematical disciplines
1.5 Physical education
13 Social sciences
Econ 201, Psych 101 or 230, 313 or 333; Soc 134

8.5-12.5 Electives
128.5 Total credits

II. Option in Coordinated Undergraduate Program

This option is offered jointly by the departments of Food and Nutrition and Institution Management. The coordinated undergraduate program integrates academic study with clinical experience during the junior and senior years. Clinical experiences will be provided at the ISU Department of Residence Food Service, Iowa Methodist Medical Center, Mary Greeley Hospital, and other health agencies and facilities, both on and off campus. Ten weeks during the senior year are spent at Iowa Methodist Medical Center in Des Moines. This program meets academic and experience requirements of the American Dietetic Association for general dietetics. Planning for this option should begin in the freshman year. Application for admission should be made during the sophomore year and applicants must have a cumulative grade point average of 2.5. Enrollment is limited by the availability of clinical facilities.

Cr. Degree Requirements

47 Food and nutrition
F N 107, 214, 305, 305L; 410, 411, 413, 418, 431, 440, 441, 442, 444, 445, 490
8-9 Communications
Engl 104, 105, Sp 211 or 212
23 Home economics
C D I F 201, HE St 101, 401; Mgt 380, 380L, 434, 435, 436, 438
9 Humanities
Select 3 credits from history, 6 credits from Art 260, 261; Din S 127, foreign languages, history, literature, music 102, 103; philosophy, religious studies
0.5 Library instruction
Lib 160
26 Natural sciences and mathematical disciplines
B B 301, 311, Biol 110, Chem 163, 163L, 231, 232A; Micro 300, Zool 155, 156
10 Social sciences
Econ 201, Psych 230, Soc 134
2-4 Recommended option
Select from Mgt 437, Stat 101 or 104
0.5 Electives
128.5 Total credits

Curriculum in Family Resource Management

Administered by the Department of Family Environment. Leading to the degree Bachelor of Science. Total credits required: 128.5.

This curriculum provides basic preparation for students who desire employment with public or private family service agencies, youth organizations, services to the aged, Cooperative Extension, and other similar employment.

Cr. Degree Requirements

29 Family environment/home economics
F E 185, 370L, 370L, 378, 391, 491; F N 107, H Ec 101, 401; C D I F E 201
14-18 Professional courses
Select from F E 300, 373, 377, 360, 471, 479, 488
14-18 Related disciplines
Select from child development, family environment (housing and the near environment and/or family resource management), psychology, sociology
36.5-37.5 General education
9 Communications
Engl 104, 105, Sp 211
Curriculum in Food Science — Food and Nutrition

Leading to the degree Bachelor of Science. Total credits required: 128.5.

Two options are available to the student wishing to major in food science.

I. Option in Consumer Food Science

This option prepares students for careers in consumer services, food industries, and business. Employment opportunities exist in experimental food kitchens, in food product development, food research laboratories, and food promotion and publicity.

Cr. Degree Requirements

32-33 Food and nutrition
F N 107, 214, 303, 305, 320, 404, 421, 422, 426, select from 410, 413, or 431
19 Communications
Engl 104, 105, 414; Jl MC 225, 325; Sp 212, 312
8 Home economics
C DIF E 201; HE ST 101, 401; Mkt 380, 380L
9 Humanities
Select 3 credits from history, 6 credits from foreign languages, history, literature, music, philosophy
0.5 Library instruction
Lib 160

128.5 Total credits

II. Option in Food Science

This option is planned for students who are especially interested in emphasizing the natural sciences in relation to food. Graduates have positions in research laboratories in colleges and universities, government agencies, foundations, and food industries. They also have a strong background for graduate study, which is basic to teaching in colleges and universities and for professional advancement in the discipline of food science.

Cr. Degree Requirements

23 Food and nutrition
F N 214, 305, 320, 404, 421, 422, 499
11 Communications
Engl 104, 105, 414; Sp 212
8 Home economics
C DIF E 201; HE ST 101, 401; Mkt 380, 380L
9 Humanities
Select 3 credits from history, 6 credits from foreign languages, history, literature, music, philosophy
0.5 Library instruction
Lib 160

128.5 Total credits

Curriculum in Fashion Merchandising

Administered by the Department of Textiles and Clothing, leading to the degree Bachelor of Science. Total credits required: 128.5.

The program in fashion merchandising is planned for students interested in careers in the marketing of textiles and clothing products by retailers and manufacturers, within the framework of sound business practices. Choices within this curriculum permit the student to plan a program suited to individual interests.

Cr. Degree Requirements

27 Textiles and clothing/home economics
T C 121, 165, 204, 245, 275, 480; Art 101, 102; C DIF E 201; F N 107, HE ST 101, 401
42-46 Professional courses
18-17 T C 304 or 404, 354 or 355, 375, 376, 464, 465
2-3 Select from T C 278, Jl MC 225, 325
9 Select from T C 475; I E 424; Mgmt 315; Mkt 343, 441, 442, 446; Soc 380
3-4 Select from Art 251; F E 240; HE ST 210
9 Select from Accct 284; Mkt 340, 447; Psych 250
3-4 Select from Chem 231; Corn 175; Psych 106; Stat 101; Gen general education

11-12 Communications: Engl 104, 105, 302; Sp 211 or 212
9 Humanities
3 History 201
6 Select from art history, foreign language, history, literature, music appreciation, philosophy, religion
0.5 Library instruction
Lib 160
11 Natural sciences and mathematical disciplines
3 Biol 109, 110; Zool 155
3 Chem 163, 163L
3 Select from Math 104, 140, 150
10 Social sciences
Econ 201; Psych 101; Soc 134
13-18 Electives
128.5 Total credits

Home Economics

10 Social sciences
Econ 201; Pol S 215; Psych 250
14 Electives
128.5 Total credits

Curriculum in Foodservice Management

Administered by the Department of Institution Management, Leading to the degree Bachelor of Science. Total credits required: 128.5.

The curriculum prepares men and women for positions as administrative dietitians, foodservice managers, and foodservice directors. Two options are available. Option I meets the academic requirements for membership in The American Dietetic Association (ADA) and qualifies a student for an internship approved by the Association.

In addition, students in the foodservice management curriculum may apply for admission to the Coordinated Undergraduate Program in Dietetics, offered jointly by the Food and Nutrition and Institution Management Departments, as described in Option II.

Students successfully completing the Coordinated Undergraduate Program meet experience as well as academic requirements of ADA while completing the requirements of the B.S. degree.

I. Option in Foodservice Management

Cr. Degree Requirements

25 Institution management*
I Mgt 287, 380, 380L, 400, 404, 434, 435, 437, 482, 580, 585
29-30 Other professional courses
Acct 284; Art 171; F N 107, 214; sp 305, 401; HE ST 101, 401; H Ed 410, 413; IE 424, 425
General education
8.5-9.5 Communications and library instruction: Engl 104, 105, Lib 160.
30. Sp 211 or 212
3 Home economics: C DIF E 201
9 Humanities**: Select from foreign language, history, literature, music, philosophy
10 Social sciences: Econ 201, Psych 230, Soc 134
Rec. Dance, health studies, and physical education: F E
18-20 Electives
128.5 Total credits

*Entering students are expected to have completed intermediate high school algebra. Students not meeting this requirement shall enroll in Math 10 and/or Math 30.

**A list of courses may be obtained in the departmental office.

II. Option in Coordinated Undergraduate Program in Dietetics

The Coordinated Undergraduate Program integrates academic study with clinical experience during the junior and senior years. Clinical experiences will be provided at the University Department of Residence Food Service, Iowa Methodist Medical Center, Mary Greeley Hospital, and other health agencies and facilities, both on and off campus. Ten weeks
Curriculum in General Studies in Home Economics

Administered by the Department of Home Economics Studies, leading to the degree Bachelor of Science. Total credits required: 128.5.

This is a flexible program in home economics for students wishing a general education in home economics, and one of the programs for those desiring to incorporate home economics as part of a preprofessional program. A student wishing to develop a program in general studies should have educational or professional goals that can best be met by this broader program of study. A statement of these goals must be approved by the department before a program is initiated. Students will be expected to have a minimum of 45 hours of courses at the 300 level or above. See adviser for additional information concerning curriculum planning.

Curriculum in Growth and Development of Children

Administered by the Department of Child Development, leading to the degree Bachelor of Science. Total credits required: 128.5.

The curriculum in growth and development of children provides the flexibility of a program useful to students who seek a double major or to those who desire their education to represent broad and philosophical emphases rather than professional-vocational ones. The curriculum also is planned for students who intend to pursue graduate studies in child development or allied areas.

Curriculum in Home Economics Education

Leading to the degree Bachelor of Science. Total credits required: 128.5.

This curriculum is designed for students interested in becoming certified to teach consumer homemaking and diversified home economics occupations in middle, junior and senior high schools. With additional credits, students may also be approved to teach in specific occupational areas: child care, fashion merchandising, and foodservice. Restricted approval to teach health education may be obtained by taking additional credits listed below. Further information about certification program appears under College of Education.

**Curriculum in Home Economics Education**

**Degree Requirements**

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Degree Requirements</th>
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<tbody>
<tr>
<td>20-23</td>
<td>Home economics</td>
</tr>
<tr>
<td>13</td>
<td>HE St 101, 401; C D F/E 201; F E 378 or 488; F N 107; H Ed 410</td>
</tr>
<tr>
<td>2-3</td>
<td>Select from Art 101 or HE St 330</td>
</tr>
<tr>
<td>3</td>
<td>Select from HE St 210, F E 240, 308, 354, 408</td>
</tr>
<tr>
<td>24-25</td>
<td>Child development/home economics</td>
</tr>
<tr>
<td>23.5</td>
<td>C D 129, C D F/E 201, C D 224, 225, 226, 318, 368; F N 107, HE St 101, 401</td>
</tr>
<tr>
<td>3-4</td>
<td>Select from C D 240, 341, 342</td>
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<tr>
<td>6</td>
<td>Select from C D 418 or 490R</td>
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</table>

**Liberal Arts**

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<tr>
<th>Cr.</th>
<th>Degree Requirements</th>
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</thead>
<tbody>
<tr>
<td>21</td>
<td>Professional courses</td>
</tr>
<tr>
<td>3</td>
<td>Select from C D 555, Psych 436</td>
</tr>
<tr>
<td>3</td>
<td>Select from Soc 305, Psych 280</td>
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<tr>
<td>6</td>
<td>Select from Psych 430, 431, Soc 461</td>
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<tr>
<td>9</td>
<td>Select from child development, sociology, anthropology, family environment, psychology, statistics</td>
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<tr>
<td>8</td>
<td>Communications</td>
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<tr>
<td>10</td>
<td>Eng 104, 105, Sp 212</td>
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<tr>
<td>9</td>
<td>Humanities</td>
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<tr>
<td>0.5</td>
<td>Library Instruction</td>
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<tr>
<td>Lib 160</td>
<td></td>
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<tr>
<td>10</td>
<td>Natural sciences and mathematical disciplines</td>
</tr>
<tr>
<td>4</td>
<td>Stat 101</td>
</tr>
<tr>
<td>3</td>
<td>Select from Biol 109, 110 or Zool 155</td>
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<tr>
<td>3</td>
<td>Select from natural sciences and mathematical disciplines</td>
</tr>
<tr>
<td>12</td>
<td>Social sciences</td>
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<tr>
<td>3</td>
<td>Select from American history or American government</td>
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<tr>
<td>3</td>
<td>Anthr 111</td>
</tr>
<tr>
<td>3</td>
<td>Soc 134</td>
</tr>
<tr>
<td>3</td>
<td>Psych 440</td>
</tr>
<tr>
<td>2.5</td>
<td>Health, dance, and physical education</td>
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<tr>
<td>H St 305</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>Select from physical education or dance activity courses</td>
</tr>
<tr>
<td>32-33</td>
<td>Electives</td>
</tr>
<tr>
<td>128.5</td>
<td>Total credits</td>
</tr>
</tbody>
</table>

**Total credits required: 128.5.**
Curriculum in Home Economics

Economics

Administered by the dean of the College of Home Economics with the cooperation of the Department of Journalism and Mass Communication.

Leading to the degree Bachelor of Science Total credits required: 128.5.

This curriculum prepares students for professional communications careers in mass media, business, industry, government, and institutions with concerns for transmitting technical information and new knowledge to varied audiences of individuals and families.

Journalism is combined with a concentration in a particular area of home economics. The student plans an individualized program with the aid of the academic journalism adviser and in consultation with the home economics department in which the student selects a concentration.

Two choices are made to define the individual program — a specialization in a career area in journalism and a concentration in a home economics subject matter area. Electives may expand the concentration into a double major, extend to a second area concentration, or be chosen from related and complementary courses.

Curriculum in Hotel and Restaurant Management

Administered by the Department of Institution Management. Leading to the degree Bachelor of Science. Total credits required: 128.5.

The curriculum in hotel and restaurant management prepares men and women for a variety of managerial positions in hotels, motels, restaurants, clubs, residence halls, and other types of establishments providing lodging and foodservice. Graduates are eligible for membership in a variety of national associations.

Curriculum in Housing and the Near Environment

Administered by the Department of Family Environment. Leading to the degree Bachelor of Science. Total credits required: 128.5.

This curriculum focuses on housing as a basic issue in the environment of individuals and families.
Curriculum in International Studies in Home Economics

Administered by the Department of Home Economics Studies, leading to the degree Bachelor of Science. Total credits required: 128.5.

Designed to provide students with a background for participation in government or agency programs, as well as provide an opportunity to become oriented to national and international affairs as part of the responsibility of citizenship in its broadest sense. Students are encouraged to pursue a double major. See adviser for additional information concerning curriculum planning.

For further information see Index: International Studies. For specific degree program write: Associate Dean, College of Home Economics

Cr. Degree Requirements

43-48 Home economics
  23 HE St 101, 401, C D / F E 201; F E 240, 378, F N 107; H Ed 410, 413, 451; C T 204, 221
  2-3 Select from Art 101, HE St 210, 330
  3 Select from C D 224, 225, 226
  3-5 Select from F N 208, 214
  12-14 Additional home economics option

8-9 Communications
  6 Engl 104, 105
  2-3 Sp 211 or 212

16 Foreign languages
  Minimum of 2 years in one language

0.5 Library instruction

16 Natural sciences and mathematical disciplines
  8 Chem 163, 163L, 231
  3 Select from Biol 109, 110, or Zool 155

5 Additional science option

4 Seminar in university studies

4 U St 230, 430

20 Social sciences
  3 American government
  4 Anthropology
  3 Economics
  3 Sociology

7 Additional social science option

6 Study of a single geographic area
  See Index: International Studies
  Select from Africa, Asia, Latin America, Middle East; Russia, or Western Europe.

9-15 Electives

128.5 Total credits

*The particular courses chosen are a function of the program emphasis selected and may include more credits than the minimum. See home economics studies coordinator.

Curriculum in Nutritional Science — Food and Nutrition

Leading to the degree Bachelor of Science. Total credits required: 128.5.

This curriculum is planned for students who are particularly interested in stressing the physical and biological sciences in relation to nutrition. Graduates have positions in research laboratories in colleges and universities, medical laboratories, foundations, and industry. They also have a strong background for graduate study, which is basic to teaching in colleges and universities and for professional advancement as a nutritionist.

Cr. Degree Requirements

23-24 Food and nutrition
  F N 214, 305, 305L, 404, 490, 499, select 7-8 credits from 410, 413, 431

11 Communications
  Engl 104, 105, 414; Sp 212

5 Home economics
  C D / F E 201; HE St 101, 401

18 Humanities and social sciences
  French 101 and 102, German 101 and 102, Russian 101 and 102, or Spanish 101 and 102, select 3 credits from history; select 7 credits from social sciences

0.5 Library instruction
  Lib 160

2-3 Management
  Select from F N 303; Mgmt 370; 1 Mgt 287, or 380 and 380L

56-59 Natural sciences and mathematical
disciplines

8-13 Electives

128.5 Total credits

The particular courses chosen are a function of the program emphasis selected and may include more credits than the minimum. See home economics studies coordinator.
Curriculum in Teaching Prekindergarten-Kindergarten Children

Administered by the Department of Child Development, leading to the degree Bachelor of Science. Total credits required: 128.5.

The student selecting the curriculum in teaching prekindergarten-kindergarten children may choose one of two options: prekindergarten-kindergarten certification or preschool handicapped approval. Both options prepare the student to meet state certification requirements for teaching prekindergarten-kindergarten children. Option 2 leads to an additional state approval to teach preschool handicapped children.

Option 1 — Prekindergarten-kindergarten Certification.

Cr. Degree Requirements
36.5 Child development/home economics
30.5 C D 129, C D 175, E 201, C D 316, 341, 342, 369, 443, 445, 449, F N 107; HE St 101, 401
6 Select from C D 224, 225, 226
27 Professional courses
6 E I Ed 204, 301, 406
3 Psych 333
12 C D 417A, 417B
6 Select from C D 240, Sp 362, Mus 364, P E 284, E I Ed 447
8 Communications
Engl 104, 105, Sp 212
9 Humanities
Select from art history, foreign language, history, literature, music appreciation, philosophy, religion
0.5 Library Instruction
Lib 160
9 Natural sciences and mathematical disciplines
3 Zool 155
3 Select from physical sciences, statistics, mathematics
3 Select from biological and physical sciences, statistics, mathematics
9 Social sciences
3 Select from American history or American government
3 Anth 111
3 Soc 134
2.5 Health, dance, and physical education
2 H S 105
0.6 Select from physical education or dance activity courses
13 Electives
128.5 Total credits

Curriculum in Textiles and Clothing Related Science

Administered by the Department of Textiles and Clothing, leading to the degree Bachelor of Science. Total credits required: 128.5.

The curriculum in textiles and clothing related science is designed for those who wish to prepare for advanced study leading to careers in college teaching or research. The physical science option prepares the student for research in textiles and forms a foundation for further study. The social science option is designed for the student interested in the historic, economic, sociological or psychological aspects of clothing and textiles.

Cr. Degree Requirements
27 Textiles and clothing/home economics
14-15 T C 304, 355, 404, additional T C
10-12 Com S 111 or 172, Phys 111 or 221, Stat 101
2-3 Select from I Mgt 287, F E 378, 415, 488
11-12 Communications:
Engl 104, 105, 414; Sp 211 or 212
9 Humanities:
3 History 210
6 Select from art history, foreign language, history, literature, music appreciation, philosophy, religion
0.5 Library Instruction:
Lib 160

Option in Physical Science
26-30 Professional courses
14-15 T C 304, 355, 404, additional T C
10-12 Com S 111 or 172, Phys 111 or 221, Stat 101
2-3 Select from I Mgt 287, F E 378, 415, 488

General education
11-12 Communications:
Engl 104, 105, 414; Sp 211 or 212
9 Humanities:
3 History 210
6 Select from art history, foreign language, history, literature, music appreciation, philosophy, religion
0.5 Library Instruction:
Lib 160

Home Economics/Sciences and Humanities

128.5 Total credits
College of Sciences and Humanities

The flexible degree requirements in the curriculum in sciences and humanities permit programs of study suited to a variety of interests and goals. The curricula in business administration and music are directed to professional development in those specified areas. Students having academic interests not fully met by a traditional major may apply for an individual major, a program of study which bridges traditional academic programs, or they may integrate three areas of concentration in a distributed studies major. The College participates in the University Honors Program; thus students of exceptional academic promise can develop unique and challenging programs of study.

The College has four curricula, a curriculum in sciences and humanities, leading to the Bachelor of Arts or the Bachelor of Science degree; a curriculum in business administration, leading to the Bachelor of Business Administration degree; a curriculum in music, leading to the Bachelor of Music degree; and an external curriculum in the liberal arts, leading to the Bachelor of Liberal Studies degree.

High School Preparation
Preparation for entrance into the college should include 4 years of English composition and rhetoric; 1 year of geometry; 1 1/2 years of algebra; 2 years of science (chemistry, physics, or biology); and 2 years of a foreign language. Moreover, students planning to study a science or in a science-related discipline should complete 1/2 year of trigonometry and an additional 1/2 year of algebra or analytic geometry. Deficiencies in any of these areas may prevent students from making normal progress in a college curriculum and adversely affect their academic records.

Foreign Language, 1983-85
Students entering the college fall semester 1983 and afterwards will have a graduation requirement equivalent to the first year of university level study in a foreign language, except that students in the curriculum in business administration will have the option of meeting the requirement through a two-semester study of a foreign language. The requirement may be met by satisfactory performance on a college language examination, and high school students are encouraged to prepare to do so through two years of study of a language in high school. If they have completed two or more years of high school study in the same foreign language with an average grade of 2.00 on a 4.00 system, then they may choose to meet this requirement with a minimum of six credits in a two-semester study dealing with foreign cultures. If they have completed three or more years of high school study in the same foreign language with an average of 2.00 on a 4.00 system, they will be considered to have met this requirement. Students who have a strong foreign language preparation are encouraged to attempt to acquire college credit by taking a test-out examination which is administered each semester by the Department of Foreign Languages and Literatures.

Transfer Students
To graduate from the College of Sciences and Humanities, a transfer student must complete the general requirements of the college as well as those of the University. Students planning to transfer to Iowa State University for the purpose of enrolling in the College of Sciences and Humanities are advised to contact the College Office, 204 Carver Hall, for information concerning degree program requirements. Prospective transfer students are urged to learn about the academic programs that are of interest to them well before arriving on campus in order to prepare for admission by taking courses which are appropriate to the planned major and transferable toward graduation from ISU. Additional information concerning transfer credit evaluation may be obtained through the Admissions Office as well as the department responsible for the major discipline in which a student is interested.

Transfer students may defer selection of a major for at least the first semester of enrollment.

A transfer student in the College of Sciences and Humanities may choose to graduate under the catalog in effect at the time of his or her graduation or under one of the two immediately preceding catalogs, provided it covers the period of his or her enrollment either at Iowa State or any other accredited school preceding enrollment at Iowa State. Full requirements of the chosen catalog must be met except that adjustments will be made in instances where courses are no longer available or where programs have been changed. A transfer student is responsible for reviewing his/her transfer credit evaluation with the academic adviser during the first semester of enrollment. A transfer student who has earned more than 77 college credits must submit a degree program by midterm of the semester following entry.

College and University Bachelor's Degree Requirements
To obtain a baccalaureate degree from the College of Sciences and Humanities, an undergraduate student must earn a minimum of 32 Iowa State University semester credits at least 8 of which are in the student's major and in which the student's grade is C or higher. At least 47 of the total credits presented for the degree must be in courses numbered 100 or above. Transfer credit in this category must be from a four-year college. Courses taken on a Pass/No Pass basis may be applied toward graduation only as electives.

The University bachelor's degree requirements, including statements of academic standards, the University residence requirement, the English proficiency requirement, and the library requirement, appear on page 28.
Curriculum in Sciences and Humanities

For the degree Bachelor of Arts or Bachelor of Science, the student must earn a total of at least 124.5 credits distributed as follows.

Cr. Basic Education Requirements
6 English 104, 105
0 Foreign language/culture
Note that in 1983 this is to become 6 or 8
0.5 Library 160

General Education Requirements
A. Students must earn the minimum credits listed in each of the four general education groups in courses outside the department of the first major listed on the degree program.
B. Students must either earn a minimum of 34 credits among the groups outside the group of the major or meet the foreign language requirement specified for 1983 and beyond and earn 26 credits among the three groups outside the group of the major. Majors in English and foreign languages and literatures are identified with group numbered major discipline as specified by the major.

A student should develop skills in and an understanding of the principal areas which serve as a basis for effective communication among people.

II. Verbal communication (minimum 2 credits). The student should develop skills in and an understanding of the principal areas which serve as a basis for effective communication among people.

III. Natural sciences and mathematical disciplines (minimum 11 credits including 3 in the mathematical disciplines and 8 in the natural sciences). The student should experience science as a rational search for understanding of the structure and behavior of the natural world, and should appreciate mathematics as an intrinsically important way of thinking and a valuable tool of the sciences.

IV. Social sciences (minimum 9 credits). The student should develop an understanding of the structure and dynamics of human social institutions, personality, and interpersonal relations.

Lists of approved courses are available from advisers or the Office of the Dean, College of Sciences and Humanities.

The Major
Departments may require more than 24 credits in the major and specify other requirements not stated as college requirements. See Index for page reference to individual department and program requirements. The major must contain at least 8 credits in courses taken at Iowa State University that are numbered 300 or above and in which the student's grade is C or higher. Courses in the first major listed on the student's degree program may not also be included in the general education groups.

The major shall be chosen from the following list, which also indicates the degree(s) offered in the respective majors:

- Anthropology, B.A., B.S.; biochemistry, B.S.; biology, B.S.; biophysics, B.S.; botany, B.S.; business administration, B.S.; chemistry, B.A.; B.S. computer science, B.S.; earth science, B.A.; B.S.; economics, B.A., B.S.; English, B.A., B.S.; environmental studies (may be taken as a second major with the degree to be determined by the first major); French, B.A., geology, B.A., B.S.; German, B.A.; history, B.A., B.S.; international studies (may be taken as a second major with the degree to be determined by the first major); journalism and mass communication, B.A., B.S.; mathematics, B.S.; metallurgy, B.S.; meteorology, B.A., B.S.; microbiology, B.S., music, B.A.; marine science, B.S.; philosophy, B.A.; physics, B.S.; political science, B.A.; psychology, B.S.; Russian, B.A., sociology, B.A., B.S.; Spanish, B.A., speech, B.A., B.S.; statistics, B.S.; zoology, B.S.

Individual majors (B.A., B.S.) and distributed studies majors (B.A., B.S.) provide broad, cross-disciplinary programs of study where appropriate. (See Index, Cross-Disciplinary Studies.)

Students may elect a second major from the departments and program areas listed above, or from a major offered for the bachelor's degree in another college of the University. Both major departments must then approve the degree program, and if those majors involve two colleges, both deans must approve. Such programs must fulfill the curriculum requirements of the College of Sciences and Humanities. If one major leads to the B.A. degree and the other to the B.S. degree, a student may elect the degree to be awarded. A student also may choose between the B.A. and B.S. degrees if one major offers both and the other major offers only one, provided the latter department is willing to defer. In all cases, the requirements for the elected degree must be met.

A student may earn both a B.A. and a B.S. degree in this curriculum with two appropriate majors and at least 30 additional credits. Either the B.A. or the B.S. in this curriculum may be earned with the Bachelor of Music or the Bachelor of Business Administration. Any degree offered by this college may be earned together with a degree with a major in any other college of the University. Two B.S. degrees or two B.A. degrees cannot be earned in this curriculum even with different majors. For the requirements for two degrees, see Index, Bachelor's Degree Requirements.

The Minor (optional)
The student may elect a minor, which must consist of at least 15 credits including 100-level courses, with at least 6 credits in courses numbered 300 and above taken at ISU with a grade of C or higher, in the department or discipline of the minor. In most disciplines there are specified minor requirements of 15-21 credits with no additional prerequisite courses within the discipline; a graduate who has completed such requirements will have the minor recorded on his or her transcript. The minor may be chosen from the list of majors or from art force aerospace studies, astronomy, genetics, military science, telecommunicative arts, theatre, or from majors offered in other colleges. A minor may include courses from two or more closely related areas if they form a strong and coherent program directed toward definite educational objectives. Examples of such minors are American Indian studies, classical studies, gerontology, linguistics, religious studies, teacher education, and women's studies.

Other Requirements
English Proficiency
The faculty of Iowa State University believes that its graduates should acquire competence in written communication during their undergraduate careers. All students must, therefore, complete or test out of a sequence of basic composition courses, normally in the freshman year. Every major department must certify that each of its candidates for graduation has achieved an adequate level of proficiency in written communication. To assure that a student can meet this requirement and to provide continued development of communication skills after the freshman year, the student's major department may (1) require, and provide critical evaluation of, term papers and other written assignments within courses offered by the department, (2) encourage students to enroll in advanced English composition courses, (3) refer students to the Writing Center operated by the Department of English. For requirements in specific majors, see the appropriate department or program listing.

Library Proficiency
Library minimum proficiency requirement must be met by satisfactory completion of one of the following options:

1. Library 160
select movement of major field by the end of the first year is strongly recommended.

Honors Program
For information on the Honors Program in the College of Sciences and Humanities, see Index, Sciences and Humanities, Cross-Disciplinary Programs, Honors Program.

ROTC Programs
The College of Sciences and Humanities also offers students the opportunity to combine their academic programs with ROTC programs in the Army, Navy, and Air Force.

Teacher Certification
Students in the College of Sciences and Humanities may be recommended for the Iowa Professional Certificate for full-time teaching of certain subjects in secondary schools. For further information, see Index, Sciences and Humanities, Teacher Education Program.

Preprofessional Programs
Students in the College of Sciences and Humanities may enroll in preprofessional programs in human health-related fields, law, speech-language pathology and audiology, and theology, and complete the requirements for admission to professional schools. For a bachelor’s degree, the student declares a major, selected from those offered by the college, and submits a degree program. Up to 32 semester credits of appropriate course work may be transferred back from some professional schools and applied toward a bachelor’s degree in the College of Sciences and Humanities. For further information, see Index, Preprofessional Study.

Program in Preprofessional Medicine Students in the College of Sciences and Humanities may enroll in the Preprofessional Medicine Program and complete the requirements for admission to the College of Veterinary Medicine under the guidance of preprofessional medicine advisers. A major (commonly biology, chemistry, distributed studies, microbiology, or zoology) is declared, usually by the junior year. With careful planning, students who are admitted to the College of Veterinary Medicine after three years of undergraduate work may use credits from the first year of professional study to complete the requirements for a bachelor’s degree in the College of Sciences and Humanities.

Curriculum in Music
This curriculum leads to the degree Bachelor of Music and is an alternative to the curriculum in sciences and humanities with a major in music. At least 126 credits, in accordance with the requirements specified below, must be earned for graduation.

14.5 Basic Education Requirements
6 English 104, 105
0 5 Library 160
8 Foreign language (one)
32 General Education Requirements
3 Students choosing the music education option should consult their advisers regarding general education requirements
6 Social sciences
2 Two-semester Integrated sequence in humanities
6 Music 383, 384
6 Physics 198, 199; mathematical, physical, and biological sciences
6 Economics
46 Music core
21 Music 120, 230, 231, 330, 331, 361
12 Music 119, 219, 319, 419
3 One of the following: Music 472, 473, 474, 475
3 One of the following: Music 430, 440, 448
7 Ensembles
34-44 Music major (select one of the following options)
34 History and literature
12 Additional music history
3 Additional music theory
8 Additional foreign language
11 Electives
36-44 Music education Certification options:
38 1) Vocal, 7-12. (a) SecEd 204, 301, 406, 426; Psych 333; (b) S-H 417K; Music 360, 362A, 465, 466; (c) 4 additional credits in applied music, electives, 3 credits
40 2) Vocal, K-12. (a) same as (a) and (b) above; (c) C 226, S-H 417L; 4 additional credits in applied music, electives, 3 credits
43 3) Instrumental K-12. (a) same as (a) and (b) above; (b) S-H 417K, S-H 417L; C 226; (c) Music 350, 351, 352, 353, 354, 355, 356, 362B, 464, 466
44 4) Instrumental, K-6. (a) El Ed 204, 301, 406; Psych 333; (b) S-H 417L; C 129, 226, 342; (c) Music 350, 351, 352, 353, 354, 356, 362B, 363, 465, 466
45 5) Vocal, K-6. (a) El Ed 204, 301, 406; Psych 333; (b) S-H 417L; C 129, 226, 342; (c) Music 360, 362A, 364, 363, 366; 4 additional credits in applied music
34 Organ
4 Music 119B, 219B
8 Music 319C, 419C
8 Music 471, 472, elective in music history
3 Additional music theory
8 Additional foreign language
3 Electives
34 Piano
12 Music 119, 219, 319, 419
9 Music 471, independent study
(literature and pedagogy)
3 Music 321, 290F (chamber music and accompanying)
Curriculum in Business Administration

This curriculum leads to the degree Bachelor of Business Administration with a major in either accounting, finance, management, marketing, or transportation/logistics. Students interested in a general business major study the curriculum in sciences and humanities with a major in business administration.

For the degree Bachelor of Business Administration the student must complete 124.5 semester credits distributed as follows:

<table>
<thead>
<tr>
<th>Cr.</th>
<th>Degree Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 A</td>
<td>Acct 284, 285</td>
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<tr>
<td>3 B</td>
<td>Fin 350</td>
</tr>
<tr>
<td>12 C</td>
<td>Mgmt 315, 316, 370, 478</td>
</tr>
<tr>
<td>3 D</td>
<td>Mkt 340</td>
</tr>
<tr>
<td>3 E</td>
<td>Tr/Log 360</td>
</tr>
<tr>
<td>21 F</td>
<td>M. Major</td>
</tr>
<tr>
<td>12 G</td>
<td>To be selected by the student and adviser to support studies in the student's major.</td>
</tr>
<tr>
<td>8 H</td>
<td>Electives</td>
</tr>
<tr>
<td>124.5 I</td>
<td>Total credits</td>
</tr>
</tbody>
</table>

Bachelor of Liberal Studies

The Bachelor of Liberal Studies degree (BLS) was established in 1977 by the Iowa Regents' universities and approved by the State Board of Regents to meet the needs of thousands of Iowans who want to earn a college degree but cannot enroll in traditional on-campus study.

The BLS degree is designed specifically for those individuals with 62 semester hours or more of the college credit already earned that may be applied toward a liberal arts degree. Each of the Iowa Regents institutions can award the degree: Iowa State University, by the College of Sciences and Humanities; The University of Iowa, by the College of Liberal Arts; and the University of Northern Iowa, by the entire institution.

About three-fourths of the total degree requirements can be transferred from accredited institutions other than the one in which the student pursues the BLS degree. Work done in community colleges, private or other accredited colleges out-of-state can be applied toward the degree, as can applicable courses taken at any of the three Iowa Regents' universities, whether on or off campus.

The BLS program has no residence requirements. To complete the degree, students may offer credits earned in various study formats: correspondence courses, radio, television, and newspaper courses; Saturday and evening courses; extension courses, including those with distance-learning formats such as University of Mid-America, and regular on-campus courses. Students may also earn credits by proficiency or test-out examinations.

The BLS offers an opportunity to earn a broadly based degree in the liberal arts, without a traditional major. Many groupings of courses are possible within the BLS framework. Each student's educational goals will be reviewed at the time of admission, and advisers will help applicants develop study plans that best fit their individual needs and goals.

Admission

Admission to the BLS program is open to persons who meet either of the following levels of previous educational attainment:

Hold the Associate of Arts (A.A.) or Associate of Science (A.S.) degree from an accredited two-year college. (Holders of the Associate of Applied Science or Associate of Applied Arts degree are not automatically eligible, although some courses may be found applicable upon review.)

Have at least 62 semester credits of collegiate work acceptable toward graduation at the chosen Regents' university with a total cumulative grade point average of at least 2.00 (a C average).

Requirements for the BLS Degree

A total of 124 semester credits is required for graduation. Within this total the following requirements must be met:

1. 45 semester credits must be earned at four-year colleges in courses defined as "upper level" where the credits were earned. (Upper-level courses at The University of Iowa and University of Northern Iowa are numbered 100 and above; Iowa State University upper-level courses are numbered 300 and above.)

2. 45 semester credits must be earned in courses at Iowa Regents' universities.

3. 30 semester credits must be earned after admission to the BLS program in the specific Regents' university that will grant the degree.

At Iowa State University, the BLS candidate must meet the basic and general education requirements of the curriculum in sciences and humanities, College of Sciences and Humanities.

In addition to general education requirements, each student's program must include a minimum of 12 semester credits in each of the following five distribution areas:

1. Humanities
2. Communications and arts
3. Natural sciences and mathematical disciplines
4. Social sciences
5. Professional fields as approved by the degree-granting institution. (Examples of professional fields are business, education, home economics.)

Lists of courses in each distribution area may be obtained from the Office of the Dean, College of Sciences and Humanities.

Of those 36 semester credits required to be earned in the three distribution areas, 24 semester credits must be in upper-level courses as defined by the institution where taken. There must be at least 6 semester credits in upper-level courses in each of the three areas chosen. Moreover, the same credits may not be used to meet both general education and distribution area requirements.

A grade average of at least 2.00 (C grade) is required in all work offered for the BLS degree, in all upper-level course work, and in all work completed after admission to the BLS program.

Further information may be obtained from the Office of the Dean, College of Sciences and Humanities, 204 Caver Hall, Iowa State University, Ames, Iowa 50011.
College of Veterinary Medicine

Phillip T Pearson, Dean
Darwood L. Baker, Associate Dean
William P. Switzer, Associate Dean
Roger M. Hogue, Assistant Dean

Departments of the College

Veterinary Anatomy
Veterinary Clinical Sciences
Veterinary Microbiology and Preventive Medicine
Veterinary Pathology
Veterinary Physiology and Pharmacology

In addition to the departments listed above, the organizational structure includes the Veterinary Medical Research Institute, the Veterinary Medical Diagnostic Laboratory, and the Biomedical Engineering Program thereby affording the student additional opportunities to observe research and diagnostic procedures.

Preventive veterinary students at Iowa State University usually enroll in either the College of Agriculture or in the College of Sciences and Humanities. The professional curriculum extends over a period of four years and leads to the degree Doctor of Veterinary Medicine.

Prescribed pre-professional college work, with a creditable academic average, is required for admission to the professional curriculum in veterinary medicine.

Qualified students may be concurrently enrolled in the professional curriculum leading to the D.V.M. degree and in a graduate program leading to the M.S. or Ph.D. degree after completion of at least 128 semester credits, or their equivalent equivalents in preventive and professional curricula. Admission to the concurrent D.V.M.-graduate degree programs is subject to the approval of the dean of the College of Veterinary Medicine and the dean of the Graduate College.

Opportunities for graduates of the College of Veterinary Medicine will be found in practice, educational institutions and industry, in international agencies, federal, state, and local governments, in the armed forces, departments of public health, comparative medicine, laboratory animal medicine, and other related fields of professional activity.

Admission Requirements

Fall Semester 1982

Applicants for admission to the College of Veterinary Medicine for fall semester 1982 must fulfill the requirements listed in the 1979-81 catalog or those listed for fall semester 1983 except that all persons admitted in the fall of 1982 will need to have met the animal nutrition requirement shown below prior to admission.

Fall Semester 1983

Applicants for admission to the College of Veterinary Medicine for fall semester 1983 and thereafter must have attended a regionally accredited college or university, have completed 40 semester credits prior to filing an application for admission, and have completed 60 semester credits prior to admission to the College of Veterinary Medicine. Credits earned must include the following Iowa State semester course offerings or their equivalents:

- English: 9 semester credits (Eng 104, 105 and 204 or 302 or 414)
- Chemistry: 20 semester credits (Chem 177, 177L, or 163, 163L, 164L) 211, 331, 332, 333A, 334A, and B B 301)
- Physics: 8 semester credits (Phys 111, 112)
- Biological Sciences: 15 semester credits Biology (Biol 110)
- Zoology (Zool 206, 206L) Microbiology (Micro 300)
- Genetics (Gen 320 or 330)
- Animal Nutrition: 3 semester credits (An $ 218 or 319)

Credits in the previously specified courses will normally be earned on the traditional four-letter grading system with A as the highest grade and D as the lowest passing grade. However, credits earned by the credit by examination program in accordance with the regulations relating to this procedure at Iowa State University are also acceptable. Credits in the preceding specified courses will not be accepted if earned under the Pass-Fail grading system or similar options.

Applications

Completed applications and supporting transcripts must be received by the Iowa State University Director of Admissions (Room 7, Beardshear Hall) by December 22 of the year prior to the year in which the applicant seeks to be admitted. Transcripts of all college credits must accompany the application.

The Veterinary Aptitude Test is required of those seeking to be admitted in 1982. Students seeking admission for the fall of 1983 and thereafter must have taken the Medical College Admissions Test (MCAT). Inasmuch as the MCAT is administered semi-annually in April and September, students seeking admission for the fall of 1983 should take the MCAT in 1982.

All preprofessional requirements must be fulfilled by the time of filing or scheduled for completion by June 15 of the year in which the applicant seeks to be admitted. A list of courses in progress at the time of filing or scheduled for completion by June 15 should accompany the application and transcripts. Preprofessional college credits must average at least 2.50 on a 4.0 marking system for the application to be accepted. The preceding scholastic requirements are minimum and do not assure admission even though these requirements have been fulfilled.

Admission to the College of Veterinary Medicine is on a competitive and selective basis. Scholastic performance in preprofessional courses, aptitude, and personal development are given consideration in the selection of candidates. Since a solid foundation in the sciences is basic to success in veterinary medicine, considerable attention is given in the admission process to applicants' grades in those areas. Consideration for admission to the College of Veterinary Medicine is administered equally to all without regard to race, color, creed, sex, national origin, disability, or age.

Admission is granted annually at the beginning of the fall semester only, with enrollment limited to 120 students per class.

In considering applicants for admission to the College of Veterinary Medicine, preference is given to residents of Iowa and certified residents of states having contracts with Iowa State University for educating veterinary medical students.
Curriculum in Veterinary Medicine

Leading to the degree Doctor of Veterinary Medicine.

First Year

<table>
<thead>
<tr>
<th>Cr.</th>
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<tbody>
<tr>
<td>3</td>
<td>Comparative Veterinary Physiology — V P P 350</td>
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<tr>
<td>9</td>
<td>Morphology of Domestic Animals — V An 301</td>
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<tr>
<td>4</td>
<td>Physiological Chemistry — B B 420</td>
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<tr>
<td>8</td>
<td>Professional Orientation — VM 300</td>
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<tr>
<td>16</td>
<td>Spring</td>
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<tr>
<td>5</td>
<td>Comparative Veterinary Physiology — Pth 351</td>
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<tr>
<td>6</td>
<td>Morphology of Domestic Animals — V An 302</td>
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<tr>
<td>6</td>
<td>Pathogenic Bacteriology and Immunology — V MPM 381</td>
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<td>17</td>
<td>Second Year</td>
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<tr>
<td>3</td>
<td>Animal Virology and Mycology — V MPM 382</td>
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<td>4</td>
<td>General Pharmacology — V P P 360</td>
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<td>5</td>
<td>General and Systemic Pathology — V Pth 371</td>
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<td>5</td>
<td>Veterinary Parasitology — V Pth 376</td>
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<td>2</td>
<td>Applied Anatomy — V An 303</td>
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<td>4</td>
<td>Clinical Medicine I. — V C S 394</td>
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<td>2</td>
<td>Physiological Sciences Laboratory — V P P 365</td>
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<tr>
<td>1</td>
<td>Pharmacology and Therapeutics — V P P 361</td>
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<td>1</td>
<td>Radiology — V C S 391</td>
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<td>4</td>
<td>Surgery and Anesthesiology — V C S 397</td>
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<td>3</td>
<td>Public Health — V MPM 384</td>
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<td>17</td>
<td>1 Electives — minimum accumulated</td>
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Third Year

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<tr>
<td>3</td>
<td>Clinical Pathology — V Pth 425</td>
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<td>3</td>
<td>Clinical Medicine II — V C S 445</td>
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<td>4</td>
<td>Special Surgery — V C S 441</td>
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<td>2</td>
<td>Physiological Sciences Laboratory — V P P 366</td>
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<td>3</td>
<td>Disturbances of Reproduction — V C S 450</td>
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<tr>
<td>1</td>
<td>Animal Reproduction Laboratory — V C S 447</td>
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<tr>
<td>1</td>
<td>Radiology Laboratory — V C S 448</td>
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<tr>
<td>17</td>
<td>Spring</td>
</tr>
<tr>
<td>3</td>
<td>Clinical Medicine III — V C S 446</td>
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<tr>
<td>5</td>
<td>Infectious Diseases and Preventive Medicine — V MPM 431</td>
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<tr>
<td>4</td>
<td>Special Pathology — V Pth 422</td>
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<td>3</td>
<td>Veterinary Toxicology — V Pth 426</td>
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<tr>
<td>3</td>
<td>Special Surgery — V C S 449</td>
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<tr>
<td>18</td>
<td>1 Electives — minimum accumulated</td>
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Fourth Year

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<td>Small Animal Surgery — V C S 463</td>
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<tr>
<td>4</td>
<td>Equine Medicine and Surgery — V C S 464</td>
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<td>4</td>
<td>Veterinary Field Services — V C S 465</td>
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<td>Anesthesiology — V C S 466</td>
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<td>1</td>
<td>Hospital Emergency Service — V C S 467</td>
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<td>2</td>
<td>Seminar — V C S 495</td>
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<td>Diagnostic Laboratory — V Pth 455</td>
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<tr>
<td>1</td>
<td>Necropsy Laboratory — V Pth 456</td>
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<tr>
<td>1</td>
<td>Clinical Pathology — V Pth 457</td>
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<tr>
<td>1</td>
<td>Laboratory in Clinical Microbiology — V MPM 465</td>
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<td>Laboratory in Public Health — V MPM 486</td>
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<td>28</td>
<td>Required</td>
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<td>12</td>
<td>Electives — minimum accumulated</td>
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Graduation Requirements

To be awarded the degree Doctor of Veterinary Medicine, candidates must have passed all required courses in the curriculum in veterinary medicine, have earned at least 12 elective credits on a graded basis of A, B, C, D, F while enrolled in the College of Veterinary Medicine, have at least a 2.0 quality-point average in the veterinary medicine curriculum, and passed the prescribed comprehensive examinations during the fourth year.

Readmission

Any student who voluntarily withdraws from the College of Veterinary Medicine or who is dropped for cause, forfeits his/her standing and must make written application for reinstatement to this college 30 or more days prior to the opening of the semester in which the student desires readmission.

Veterinary Medical Societies

All veterinary students are expected to become active members of the Iowa State Student Chapter of the American Veterinary Medical Association. The monthly meetings of the chapter serve to promote the professional and social development of the members. Students of veterinary medicine may also qualify for membership in the national honor societies of Phi Zeta, Phi Kappa Phi, Alpha Zeta, and Gamma Sigma Delta. Graduate students may qualify for membership in Sigma Xi.
Graduate College

Daniel J. Zaffarano, Vice President for Research and Dean
Norman L. Jacobson, Associate Vice President for Research and Associate Dean
George G Karas, Associate Dean
Martin J. Umler, Associate Dean

The Graduate College at Iowa State University is responsible for the quality of graduate education, for administering students' graduate programs and for promoting research support from various governmental, industrial, and private agencies.

Members of the graduate faculty have a dual role of teaching and research. All courses offered for major or minor credit are taught by graduate faculty members. Through an advisory committee system, they supervise individual programs of study which are specially designed for each graduate student's needs.

The graduate faculty includes the president, the vice-president for academic affairs, the dean and associate deans of the Graduate College, and the deans of the Agricultural College, Home Economics College, and Engineering and Home Economics College. The graduate faculty also includes the president, the vice-president for academic affairs, the dean, and associate deans of the other seven colleges, the dean of library services, and the directors and associate directors of research institutes as full members. Executive officers of departments and other members of the General Faculty may be elected to associate or full membership in recognition of accomplishments in their respective disciplines.

Graduate study was offered almost as soon as the University was founded, and the first graduate degree was conferred in 1877. Experimentation and research also started early, first in agriculture and shortly thereafter in home economics, engineering, science, and veterinary medicine. In 1913, a distinct graduate faculty was organized and an executive graduate committee appointed. In 1915, the graduate faculty held its first meeting and in 1916 it granted the first degree, Doctor of Philosophy.

Graduate education is vital to the quality of university teaching. The creative efforts of graduate faculty members and graduate students result in knowledge necessary to help society solve problems in educational, scientific, technological, and socio-economic areas. The Graduate College encourages educational exchange and contact with undergraduate areas of the University to promote improved teaching on both the undergraduate and graduate level. A part of this exchange is accomplished by books and technical articles which are made possible by graduate research.

The degrees Master of Arts, Master of Science, and Doctor of Philosophy are research oriented, although in certain fields the Master of Arts and the Master of Science degrees are also available without thesis. For those persons interested in advanced study directed more particularly toward meeting vocational or professional objectives, the degrees Master of Agriculture, Master of Architecture, Master of Community and Regional Planning, Master of Education, Master of Engineering, Master of Landscape Architecture, Master of Public Administration, and Specialist are offered.

Graduate Appointments
Graduate assistantships, fellowships, and certain special research grants have been established at Iowa State University for the encouragement of graduate work and the promotion of research. Such appointments and research opportunities are available through the various departments of instruction, the Agriculture and Home Economics Experiment Station, the Research Institute for Studies in Education, the Engineering Research Institute, the Home Economics Research Institute, the Veterinary Medical Research Institute, the Statistical Laboratory, the Computation Center, the Energy and Mineral Resources Research Institute, the Water Resources Research Institute, and the Office of the Vice President for Research.

A half-time graduate assistantship permits the holder to enroll for a maximum of 12 semester credits. Recipients of these assistantships are assessed fees at resident rates. Students who are graduates of a regionally accredited college or university in the United States or of a recognized institution in another country whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University, who graduated in the highest quartile of their respective classes and who present the requisite undergraduate or graduate preparation, may apply for these appointments. Students registered on a restricted or nondegree basis and those placed on academic probation are not eligible for assistantship appointment. Further information may be obtained by writing to the appropriate department head.

The satisfactory completion of one appointment, plus satisfactory academic performance, will ordinarily make a student eligible for reappointment. After a period of 5 years of full time study for the master's degree or 7 years for the doctorate, the student will not normally be continued on assistantship support.

Fellowships and traineeships supported by agencies of the federal government are sometimes available. Applicants for these awards must present evidence of superior scholarship. Further information may be secured by writing to the dean of the Graduate College.

The satisfactory completion of one appointment, plus satisfactory academic performance, will ordinarily make a student eligible for reappointment. After a period of 5 years of full time study for the master's degree or 7 years for the doctorate, the student will not normally be continued on assistantship support.

Fellowships and traineeships supported by agencies of the federal government are sometimes available. Applicants for these awards must present evidence of superior scholarship. Further information may be secured by writing to the dean of the Graduate College.

The MASUA Traveling Scholar Program is designed to provide breadth and depth in the opportunities for graduate study offered at MASUA universities by permitting advanced graduate students to study at another MASUA university where they may utilize unique facilities or specializations.

Graduate students at MASUA universities are eligible to participate in this program for a minimum of one term of enrollment. The student's major advisor initiates the proposal for the student's participation by contacting the professor at another MASUA university where the student wishes to study. The graduate dean at each university involved must concur in proposed participation. During the time of participation, the student will register for research or special topics credit for the appropriate number of hours and pay fees at the home university. Graduate students chosen to participate in the program will be provided $100 for travel and a stipend of $50 monthly for a minimum of three months (payable from MASUA funds upon return to the home institution).

Additional information concerning the MASUA Traveling Scholarship Program is available at the Graduate Office.

Postdoctoral Study
Opportunities are provided for postdoctoral study through the extensive research programs of the University. Inquiries should be directed to the appropriate department, institute, or to the dean of the Graduate College.

Graduate Study by Members of the Staff
Any full-time member of the research, instructional, or extension staffs of the rank of instructor, subject to the approval of the head of his or her department or section, may carry on more than 6 semester credits of graduate work per semester, provided such does not interfere with other duties. This privilege may be extended to members of the research, instructional, or extension staffs of the rank of assistant professor upon approval of the dean of the employee's college and the dean of the Graduate College.

Staff members holding the rank of professor or associate professor cannot become candidates for degrees from this institution.

Admission
Admission to the Graduate College may be granted to a graduate of an institution in the United States which is accredited by a recognized regional association or to a graduate of a recognized institution in another country whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University. For information concerning graduate study in a particular academic discipline, a prospective student is invited to correspond with the head of the department in which he or she wishes to study.
Application forms are available from the Office of Admissions, 7 Beardshear Hall. These forms, together with official transcripts and statement of academic rank, should be forwarded to the Office of Admissions at least one month prior to the opening of the semester when the student wishes to matriculate. An application fee of $10 is charged each applicant formally applying for admission to the Graduate College. If the undergraduate is from Iowa State University or if the student is applying for nondegree admission, no application fee is assessed.

Graduate Record Examination. The Graduate Record Examination (GRE) is not a university-wide requirement for all applicants. However, some departments require or recommend submission of GRE scores. Individual departmental statements appearing later in this catalog should be consulted for this information.

Full Admission. An applicant who is a graduate of a regionally accredited institution in the United States or of a recognized institution in another country whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University, and who ranks in the upper one-half of his or her class, may be admitted to the Graduate College, if recommended by the department and approved by the dean of the Graduate College. Admission does not constitute acceptance as a candidate for a degree.

Provisional Admission. An applicant who is a graduate of a regionally accredited college or university in the United States or of a recognized institution in another country, whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University, and who ranks in the upper one-half of his or her class, may be admitted to the Graduate College, if recommended by the department and approved by the dean of the Graduate College. Provisional admission requires recommendation of the major professor and approval by the Graduate College.

Restricted Admission may be granted to persons who are graduates of regionally accredited universities or colleges of the United States but who do not rank in the upper one-half of their class, and to graduates of recognized foreign institutions. This status requires the recommendation of the major department and approval of the dean of the Graduate College. Transfer from restricted to full admission usually requires completion of at least 10 semester hours of graduate level courses with a grade average of B or above. The recommendation must be submitted by the student's major professor and approved by the dean of the Graduate College.

Nondegree Admission. A graduate of a regionally accredited university or college in the United States may be granted nondegree admission: (1) to take course work for subsequent transfer to other institutions; (2) to enroll occasionally in off-campus graduate courses; or (3) to take graduate courses without pursuing an advanced degree program. Transfer from nondegree admission requires submission of complete academic records, recommendation by the department head and the approval of the graduate dean, and payment of an application fee of $10 by those who do not have an undergraduate degree from Iowa State University.

For those students admitted to the Graduate College for nondegree study, no more than 9 semester hours of graduate credit earned under the non-degree option may be applied if the student later chooses to undertake a degree option. The student's advisory committee will recommend which courses, if any, taken on a nondegree basis may be included in the program of study.

Medical Examination

New students will be sent a medical history form with their letter of admission. This form must be completed and on file at the Student Health Service before a student can be treated by a physician there. All records are confidential. Students registered on a restricted or nondegree basis may be admitted to the Graduate College. A copy of the record may be sent to a physician of the student's choice.

English Requirement

The status of all graduate students whose native language is English is determined at the time of admission. Students who fall into one of the following categories have fulfilled the English requirement: 1) have completed an undergraduate English composition sequence with a B average or better; 2) have passed, as an undergraduate, an English examination which tests the ability to communicate in writing (similar to the ISU Graduate English Examination); and 3) have written in the English language a master's thesis which has been accepted by a regionally accredited college or university; or 4) have passed the Graduate English Examination as specified by the major department. Individual departments may establish more stringent requirements. The departments of Chemistry, Earth Sciences, Physical Education and Veterinary Pathology require their students to satisfy the requirement by taking the Graduate English Examination. English students (except those admitted on a nondegree basis) who are required to take the Graduate English Examination should do so before completing 12 credit hours of graduate work at Iowa State University.

Foreign Students

An applicant who is a graduate of a recognized foreign institution is subject to the same criteria for admission as a graduate from an institution in the United States and may be recommended for the same admission categories described above. The admission deadline for international students is one month prior to the first day of classes for each semester.

A graduate student whose native language is not English must take a special English placement examination administered by the Department of English in lieu of the standard qualifying examination.

Students registered on a restricted or nondegree admission basis and those placed on probation are not eligible for assistantship appointment.

Foreign students are required to carry adequate health and accident insurance while in residence.

Registration

Planning Graduate Study. Scholastic competence, independence and maturity of thought should have dominance over other objectives of graduate study. Students must accept responsibility for their own education and should recognize that excessive emphasis on course work will not leave time to explore and master aspects of learning which will give them confidence in their own judgments. As soon as possible, in conference with the head of the department, the student should select a major professor and advisory committee and in consultation with them outline a program of study.

Residence Registration. Classification in courses carrying full graduate credit is limited to a maximum of 15 credits per semester. Schedules for graduate assistants on one-half time appointments are limited to a maximum of 12 credits. For full-time staff members, the limit is 6 credits.

Even though course and residence requirements have been met, graduate students must register in any semester in which the facilities of the institution or staff time are being used, including library borrowing privileges and preparation of thesis or dissertation, or preparation for examination. The student must be registered during the semester in which the preliminary and final examinations are held.

Interim Registration. Registration for special work between semesters and during certain vacation periods cannot exceed 1 credit for each week that the student is in residence.

"In Absentia" Registration. Graduate work by correspondence is not permitted, nor is it accepted in transfer. In absence registration is restricted to thesis preparation after completion of research or for research under special conditions. The total credit thus obtained cannot be used to reduce residence requirements.

Extension and Off-campus Registration. Many departments offer off-campus classes taught by members of the university graduate staff. For this purpose special arrangements are made for the necessary library and laboratory resources so that the classes are equivalent to those taught on campus.

Continuing Registration Policy. Graduate students who pass the oral preliminary examination for the Ph.D. degree and leave the Ames campus for one or more semesters before receiving their degrees must pay an "R" fee.
each semester for maintenance of their records each semester. They are absent, and are not using university facilities or faculty time. This fee must be continued each semester excluding summer term.

Students who have passed the preliminary oral examination and are using university offices and/or faculty time must register each semester for an appropriate number of credit hours and must pay resident or nonresident fees, in accordance with their residency status, regardless of being primarily on campus or off campus.

Auditing. Courses may be audited upon recommendation of the student's major professor. Each audited course will reduce the permitted credit load by one, but fees will be assessed on the basis of the credit hours of the course.

Graduate Courses Taken by Seniors. Certain graduate level courses listed in the General Catalog may be taken for graduate credit by undergraduate seniors at Iowa State University. If a student is admitted for graduate study at Iowa State University, the advisory committee at the time the program of study is submitted may request approval from the graduate dean that up to 9 semester hours of such credit be applied toward meeting advanced degree requirements. Credits earned in these courses must be in addition to those used to meet requirements for the bachelor's degree.

Special Regulations for Students in Veterinary Medicine. Specially qualified advanced students in veterinary medicine may request permission from the dean of the College of Veterinary Medicine and the dean of the Graduate College to pursue work coincidently toward the degrees Master of Science or Doctor of Philosophy and Doctor of Veterinary Medicine.

To participate in such a concurrent program, a student must be admitted to the Graduate College and an advisory committee must be appointed according to the usual procedures. A program of study must be submitted to the Graduate College and the College of Veterinary Medicine for approval.

Degree Requirements

A Graduate Student Handbook is available in the Graduate Office. Each new graduate student is urged to obtain a copy. A Graduate Faculty Handbook, listing policies and procedures of the Graduate College, is also available to all staff members and may be obtained at the Graduate Office.

Probation. To remain in good standing, a student must maintain an average of B or better on all work taken in the Graduate College (exclusive of research credits). A student may be placed on probation for failure to meet scholastic requirements. Removal from probation is accomplished upon specific recommendation from the student's major professor to the Graduate College. Students will not be admitted to candidacy while on probation. Generally registration beyond the second semester will be refused to a student whose quality of work is unsatisfactory.

Time Limit. It is expected that work for the master's degree shall be completed within five years. A student beginning a Ph.D. degree program at Iowa State with a master's degree is expected to complete the Ph.D. within five years, while a student beginning a Ph.D. degree program without the master's degree is expected to complete the program within seven years. In special circumstances the student's advisory committee may recommend that the graduate dean extend these degree time limits. Cases in which the student leaves Iowa State during his or her graduate career and later returns are dealt with individually by the student's advisory committee and the Graduate Office.

Master of Science and Master of Arts

A student on full admission becomes eligible for candidacy after completing one semester's work with a B average. General requirements for the degree are as follows:

Appointment of the Student's Advisory Committee. As soon as practicable after the student enrolls in the Graduate College, the department head or chairman shall recommend to the dean of the Graduate College a committee of the graduate faculty to be in charge of the student's work.

This committee shall consist of at least three members of the graduate faculty, one of whom must be from a department other than that in which the student is enrolled. At least one member of the committee should be a full member of the graduate faculty. An associate member of the graduate faculty may serve as a major professor for a master's degree candidate. A faculty member holding a joint appointment may serve as an "outside the department" member on a committee if the student's major is in either of the departments represented in the joint appointment.

Program of Study. A program of study, developed by the student and major professor in consultation with the program of study committee should be submitted for approval by the end of the second semester in residence.

Residence. There is no on-campus residence requirement for the master's degree.

Credits. At least 30 credits of acceptable graduate work must be completed, not less than 22 of which must be earned from this institution.

Any transfer of credits from another institution must be recommended in the program of study by the student's program of study committee. Graduate credit will be approved for transfer only if it is of B grade or better.

Major. The exact number of credits in a major is not prescribed. To obtain the specialization which is considered essential for an advanced degree, approximately two-thirds of the work should be devoted to the major field, but this is not necessarily restricted to one department. A formal minor may be declared but will require approval by the minor department.

A graduate student may not change from one department to another without written permission from the heads of departments involved, and approval of the dean of the Graduate College.

Foreign Languages. There is no uniform language requirement for the Graduate College. Please see the departmental descriptions in this catalog for specific departmental requirements.

For those departments wishing to utilize them and for students interested in transferring a foreign language test score elsewhere, the University offers the standardized examinations provided by Educational Testing Service.

For students whose native language is not English, the ability to communicate adequately in English (certified by the Department of English) may be acceptable as a substitute for the reading knowledge of one foreign language. This option will apply only when specifically recommended by the student's program of study committee.

The foreign language requirements, where applicable, must be met before the semester in which the student will receive the degree.

Application for Graduation. Application for graduation must be made by midyear of the semester preceding the semester in which the student expects to receive the degree. This requires the presentation of an approved diploma slip to the Office of the Graduate Dean.

Thesis. A thesis is required in all areas in which the M.S. or M.A. is granted, except where specific provision is made for a none thesis degree program. Joint authorship is not permitted. Copies of the completed thesis must be in the hands of the examining committee and the Thesis Office for approval two weeks prior to the date fixed for the final examination. After the final examination, two unbound approved copies of the thesis shall be deposited with the Thesis Office, 213 Beardshear Hall. These copies of the thesis must be deposited not less than two weeks prior to commencement. A charge of $30 will be made to cover library costs and title publication in Iowa State Journal of Research.

The student should consult The Graduate College Thesis Manual for instructions about thesis preparation and time schedules.

Final Examination. After all other requirements have been met, the final examination shall be taken over all graduate work, including the thesis where applicable. It will be oral, but may be written in part if specified by the committee in charge.

Graduation Approval Slip. This slip is prepared by the Office of Student Records about two weeks before the end of a semester. Candidates wishing to secure this form at any earlier date should file a request with the Graduate Office at least three days prior to the time the form is needed.
Master of Science and Master of Arts — Nonthesis
In certain departments a nonthesis degree program may be undertaken. This will require satisfactory completion of at least 30 credit hours of acceptable work (not including research credits) and satisfactory completion of a comprehensive examination. Every nonthesis master's program, however, must present substantial evidence of individual accomplishment which may vary from a special report, for example, or an annotated bibliography to a project on research, design, or other creative endeavor. A minimum of three hours of such independent work is required on every program of study for a nonthesis master's degree. This element of creative independent study shall be explicitly identified on the program of study. Detailed requirements may vary with fields. Reference should be made to the departmental descriptions in this catalog.

Master of Agriculture
The major in professional agriculture is an off-campus, non-thesis program leading to the degree Master of Agriculture. It is available to students wishing to pursue graduate study in agriculture without taking formal course work on campus. The program is considered to be a terminal master's degree. Students are required to take a minimum of two courses in each of three disciplines and complete 24 semester credits of formal course work. Courses are offered in Agricultural Mechanization, Agronomy, Animal Science and Economics. A minimum of four credits of creative component experience is required. Four workshops of one credit each are also required.

Master of Architecture
The Department of Architecture offers several programs leading to the degree Master of Architecture. A professional degree. Beyond the degree Bachelor of Agriculture, a minimum of 30 graduate credits is required. Beyond the degree B.A. or B.S. in architecture or environmental design, a minimum of 60 credits is required. For students with other baccalaureate degrees, a program of more than 60 credits will be taken to each student's experience, training, and education. For programs of 60 credits or more, 40 of these credits must be graduate credits.

Master of Community and Regional Planning
The degree Master of Community and Regional Planning requires 52 semester hour credits, including a 9 credit thesis.

Master of Education
For the degree master of education, a minimum of 30 credits of graduate level courses will be required. A credit by examination is required in which the student demonstrates an ability to perform creative, independent study.

Master of Engineering
The academic standards and the general level of attainment are the same for the Master of Engineering and Master of Science degrees. Master of Engineering programs are offered to meet the needs for professionally oriented programs on campus, and for off-campus professionally oriented programs at locations with adequate library and laboratory facilities. An appropriate number of credit hours in design, laboratory work, computation or independent study is required as evidence of individual accomplishment. Of the minimum credit requirement of 30, 22 credits must be received from Iowa State University.

Master of Landscape Architecture
The degree Master of Landscape Architecture requires a minimum of 40 graduate credits and the satisfactory completion of a thesis or a terminal project.

Master of Public Administration
This is a professional degree program designed to provide training necessary for an administrator in a public or quasi-public bureaucracy. A minimum of 39 semester credit hours is required in six subject areas. Either an internship in a governmental unit or a thesis is required.

Specialist
This degree is a post-master's degree in school psychology requiring 60 hours of work beyond the baccalaureate. It requires a thesis equivalent to a master's thesis, and an internship in the public schools of not less than 600 clock hours.

Doctor of Philosophy
The degree Doctor of Philosophy is strongly research oriented. The primary requirements for the degree are: 1) high attainment and proficiency of the candidate in his or her chosen field, (2) development of a dissertation which is a significant contribution to knowledge and which shows independent and creative thought and work, and (3) successful passing of detailed examinations over the field of the candidate's major work, with a satisfactory showing of preparation in related courses.

Appointment of the Student's Program of Study Committee. As soon as practical after the student enrolls in the Graduate College, the department head or chair shall recommend to the dean of the Graduate College a committee of the graduate faculty to be in charge of the student's graduate program. This committee shall consist of at least five members of the graduate faculty, three of whom must be full members. At least two committee members must be from the major or area of specialization, and at least one of these must be outside the major department. A faculty member holding a joint appointment may not serve as an "outside the department" member on a committee if the student's major is in either of the departments represented in the joint appointment. An associate submitting the graduate faculty may not serve as a major professor of a doctoral program but may co-chair a doctoral committee.

Program of Study. A program of study should be developed by the student in consultation with his or her major professor and committee. This should be submitted for approval by the end of the second semester in residence.

Residence. A minimum of 72 graduate credits must be earned for a Ph.D. degree. At least 36 credits including all dissertation research credits must be earned under the supervision of the student's program of study committee. Graduate credits of B grade or better earned in another institution may be transferred at the discretion of the program of study committee and the approval of the department and Graduate College. Transfer of S and "pass" grades may be accepted for research only when such grades can be documented as being B grade or better. Responsibility for submitting such documentation to the Graduate College rests with the student's program of study committee.

At least 24 credits must be earned during two consecutive semesters while in residence at the University.

Major and Minor. A major is the area of study or academic concentration in which a student chooses to qualify for the award of a graduate degree. Majors are listed for departments and interdepartmental programs in the Courses and Programs section of the catalog. To avoid overspecialization, a significant body of pertinent course work must be taken outside of the major field. The work outside the major field should amount to approximately 12 hours of applicable graduate credit as required by the student's committee.

Opportunities also exist for majoring in more than one area of study. A double major may be declared, in which case the student must meet certain minimum requirements established by the department administering the minor.

Foreign Languages. The Graduate College has no uniform requirements. Foreign language requirements for those departments having them are specified in the individual department descriptions in the Courses and Programs section of this catalog. For those departments wishing to use them and for students interested in transferring a foreign language test score elsewhere, the University offers the standardized examinations provided by the Educational Testing Service. For students whose native language is not English, the ability to communicate adequately in English (certified by the Department of English) may be acceptable as a substitute for the reading knowledge of one foreign language. This option will apply only when specifically recommended by the student's program of study committee.

The foreign language requirement, when applicable, may be fulfilled at any time, but not less than six months prior to the final examination.
Summary of Graduate Degrees, Majors and Areas of Specialization*


Agricultural Education — M.S., Ph.D. — Agricultural Education.


Anthropology — See Sociology.

Architecture — M. Arch. — Architecture.


Biochemistry and Biophysics — M.S., Ph.D. — Biochemistry, Biophysics.

Biomedical Engineering (Interdepartmental Program) — M.S., Ph.D. — Biomedical Engineering.


Chemical Engineering — M. Eng., M.S., Ph.D. — Chemical Engineering.

Chemistry — M.S., Ph.D., — Analytical Chemistry, Chemistry, Inorganic-Organic (Ph.D. only), Physical-Inorganic (Ph.D. only), Analytical-Physical, Organic-Analytical (Ph.D. only), Inorganic Chemistry (Ph.D. only), Organic Chemistry, Physical Chemistry.

Child Development — M.S., Ph.D. — Child Development.

Civil Engineering — M.S., Ph.D. — Civil Engineering (M.S. only), Geodesy and Photogrammetry (M.S. only), Municipal Engineering (M.S. only), Sanitary Engineering, Geotechnical Engineering, Structural Engineering, Transportation Engineering.

Community and Regional Planning — M.C.R.P. — Community and Regional Planning.

Computer Science — M.S., Ph.D. — Computer Science.

Earth Sciences — M.S., Ph.D. — Earth Science, Geology, Meteorology.

Economics — M.S., Ph.D. — Agricultural Economics, Economics.

Education — See Professional Studies.

Electrical Engineering — M. Eng., M.S., Ph.D. — Electrical Engineering, Electromagnetics (Ph.D. only), Control Engineering (Ph.D. only), Electric Power (Ph.D. only).

Energy Systems Engineering — Interdepartmental minor only.


English — M.A. — English.

Entomology — M.S., Ph.D. Entomology, Behavior, Biological Control, Ecology, Economic Entomology, Medical Entomology, Host Plant Resistance, Morphology, Pathology, Pest Management, Physiology, Systematics, Insecticide Toxicology.

Family Environment — M.S., Ph.D. (joint major) — Family Environment.

Food and Nutrition — M.S., Ph.D. — Food and Nutrition (M.S. only), Food Science, Nutrition.

Food Technology — M.S., Ph.D. — Food Technology, Meat Science (joint major).

Forestry — M.S., Ph.D. — Forestry, Administration and Management (M.S. only), Biology (M.S. only), Biometry, Economics and Marketing (M.S. only), Forest Economics (Ph.D. only), Biology — Wood Science (Ph.D. only).

Geology — M.S., Ph.D. — Geological Science.

General Graduate Studies (Interdepartmental Program) — M.A., M.S., General Graduate Studies, Arts and Humanities, Biological Sciences, Physical Sciences, Social Sciences.

Genetics — M.S., Ph.D. — Genetics.

Gerontology — Interdepartmental minor only.

History — M.A., Ph.D. — History (M.A. only), History of Technology and Science.
Home Economics Education — M.Ed., M.S., Ph.D. — Home Economics Education.

Horticulture — M.S., Ph.D. — Horticulture.

Housing — Interdepartmental minor only.

Immunobiology (Interdepartmental Program) — M.S., Ph.D. — Immunobiology.

Industrial Administrative Sciences (Interdepartmental Program) — M.S. — Industrial Administrative Sciences.


Industrial Engineering — M. Eng., M.S., Ph.D. — Engineering Valuation, Industrial Engineering (M. Eng., M.S. only), Operations Research (co-specialization, M.S. only)

Industrial Relations (Interdepartmental Program) — M.S. — Industrial Relations.

Institution Management — M.S., Ph.D. (joint major) — Institution Management.

Journalism and Mass Communication — M.S. — Journalism and Mass Communication

Landscape Architecture — M.L.A. — Landscape Architecture


Mathematics — M.S., Ph.D. — Applied Mathematics, Mathematics

Mechanical Engineering — M.S., Ph.D. — Mechanical Engineering

Microbiology — M.S., Ph.D. — Microbiology, Applied, Food, Medical, Systematic Microbiology, Immunology, Microbial Ecology, Genetics, Morphology, Physiology, Virology.

Molecular, Cellular, and Developmental Biology — Interdepartmental major only

Nuclear Engineering — M. Eng., M.S., Ph.D. — Nuclear Engineering.

Physical Education — M.S. — Physical Education


Plant Pathology, Seed and Weed Sciences — M.S., Ph.D. — Plant Pathology, Seed Science, Weed Science.

Political Science — M.A., M.P.A. — Political Science, Public Administration

Professional Agriculture — M.Agr. — Professional Agriculture.

Professional Studies in Education — M.Ed., M.S., Ph.D. — Education; Adult and Extension Education; Curriculum and Instructional Media; Educational Administration; Elementary Education (M.S. only); Counselor Education; Higher Education; History, Philosophy, and Comparative Education; Learning Disabilities (M.S. only); Research and Evaluation.

Psychology — M.S., Sp, Ph.D. — Psychology, School Psychology (Sp. only).

Sociology and Anthropology — M.A., M.S., Ph.D. — Rural Sociology, Sociology, Anthropology (M.A. only).


Technology and Social Change — Interdepartmental minor only.

Textiles and Clothing — M.S. — Textiles and Clothing

Transportation Planning — Interdepartmental major only

Veterinary Anatomy — M.S., Ph.D. — Veterinary Anatomy

Veterinary Clinical Sciences — M.S. — Veterinary Clinical Science, Veterinary Radiology, Theriogenology, Veterinary Surgery, Veterinary Medicine.

Veterinary Microbiology and Preventive Medicine — M.S., Ph.D. — Veterinary Microbiology, Veterinary Preventive Medicine (M S only)

Veterinary Pathology — M.S., Ph.D. — Veterinary Pathology, Veterinary Parasitology, Veterinary Toxicology.

Veterinary Physiology and Pharmacology — M.S., Ph.D. — Veterinary Physiology, Pharmacology.

Water Resources — Interdepartmental major only

Zoology — M.S., Ph.D. — Zoology, Animal Behavior, Cellular Biology, Comparative Physiology, Ecology, Endocrinology, Immunology, Cellular, Molecular and Developmental Biology; Neurobiology, Parasitology, Physiology

Interdepartmental Offerings and Cooperating Departments

Interdepartmental Programs

Biomedical Engineering — College of Engineering, College of Veterinary Medicine

General Graduate Studies — all departments offering graduate courses

Immunobiology — Agronomy, Animal Science, Biochemistry and Biophysics, Food and Nutrition, Genetics, Microbiology, Veterinary Microbiology and Preventive Medicine, Veterinary Pathology, and Zoology

Industrial Administrative Sciences — Business Administration, Economics, Industrial Engineering, Statistics.

Industrial Relations — Economics, Industrial Engineering, Political Science, Psychology, Sociology

Interdepartmental Majors

Molecular, Cellular, and Developmental Biology

Agronomy, Animal Science, Biochemistry and Biophysics, Botany, Food Technology, Genetics, Microbiology, and Zoology.

Transportation Planning — Business Administration, Civil Engineering, Community and Regional Planning, Economics, Industrial Engineering, Political Science, and Sociology.


Interdepartmental Minors


Housing — Architecture, Art and Design, Community and Regional Planning, Family Environment, Landscape Architecture

Courses and Programs

Information About Courses

Course Numbers
The courses in each department are numbered from 1 to 499, according to the following groups:

- 1-99 — Courses not carrying credit toward a degree.
- 100-299 — Courses primarily for freshman and sophomore students.
- 300-499 — Courses primarily for junior and senior students.
- 500-599 — Courses primarily for graduate students, but open to qualified undergraduates.
- 600-699 — Courses for graduate students only.

Credits and Contact Hours
The academic value of each course is stated in semester credits. Each credit is normally earned by attending one (50-minute) hour of lecture or recitation per week for the entire semester, or by attending a laboratory or studio period of two or three hours per week. In addition, undergraduate students typically will be expected to spend two hours in preparation outside of class for each lecture or recitation hour; additional outside work may be required for laboratory or studio classes.

Each course states the number of semester credits assigned to the course, preceded in parentheses by the number of hours in class (contact hours) expected of the student. The first of the two contact-hour numbers indicates the number of lecture or recitation class hours per week for the semester. The second is the number of laboratory or studio hours required per week.

The term "Cr. arr." means that the amount of credit is arranged in advance between the student and the instructor. The credit to be earned depends on the amount of work expected of the student, in accordance with the policy that some combination of teacher-student contact and outside work by the student involving at least three hours per week for the entire semester is required for each credit.

The term "Cr. R." means that the course is required in a certain curriculum, but no credit is given.

Semester of Offering
Within each course description may be found one or more of the following letters: F, S, SS, indicating which term—fall, spring, summer session—of the academic year the course is offered. "Alt." is the abbreviation for alternate offering. The abbreviation "Yr." is used to designate a sequence of two courses taught fall and spring, respectively. If there is sufficient demand, courses may be offered more frequently than announced.

Course Prerequisites
A prerequisite indicates the specific academic background, or general academic maturity, considered necessary for the student to be ready to undertake the course. Prerequisites are usually stated in terms of specific courses, but equivalent preparation is usually acceptable. An instructor may, however, direct a student whose background does not meet the stated prerequisite, or its equivalent, to drop the course. Conversely, an instructor may waive the prerequisite for a course for which he or she is responsible. Thus, permission of the instructor is understood to be an alternate to the stated prerequisite in all courses.

Designators
For a list of abbreviations designating departments and programs, see page 29.

Graduate Programs

Graduate Major
A major in the Graduate College is the area of academic professional concentration, approved by the Board of Regents, in which the student chooses to qualify for the award of a graduate degree.

Graduate Area of Specialization
Areas of specialization are indicated in the graduate statements of some departments. This is a subdivision of a major in which a strong graduate level program is available. When approved by the Graduate College, such areas of specialization are shown parenthetically after the major on official records and transcripts.

Interdepartmental Programs
Interdepartmental programs are available at both graduate and undergraduate levels. An interdepartmental program is an administrative structure usually not functioning as a department, ordinarily headed by an advisory committee, and offering a degree with major(s) in that subject area. Interdepartmental programs have been officially approved and may offer courses.

Aerospace Engineering

Lennox N. Wilson, Acting Head of Department
Professors: Anderson, Hsu, Iversen, McDaniel, Peterson, Pienso, Tannenhill, Wilson
Associate Professors: Herman, James, Severnske, Steve
Assistant Professor: Hindman

Undergraduate Study
For undergraduate curriculum in aerospace engineering leading to the degree Bachelor of Science, see College of Engineering, Curricula.

The aerospace engineer is primarily concerned with the design, analysis, testing, and operation of vehicles which operate in an atmosphere, a fluid medium, or outer space as well as on land and water surfaces. The curriculum is designed to provide the student with an education in the fundamental principles of aerodynamics, flight mechanics, propulsion, structural mechanics, controls, design, testing, space, and hydrospace technology. A wide variety of opportunities await the aerospace engineering graduate in research, development, design, production, sales, and management in the aerospace industry, and in many related industries in which fluid flow, control, and transportation problems play a major role.

A cooperative education program in aerospace engineering is available in conjunction with several industries and government concerns. The usual four-year curriculum is extended over a five-year span to permit alternate industrial experience periods and academic periods. This arrangement offers valuable practical experience and financial assistance during the college years. See College of Engineering, Cooperative Programs.

Graduate Study

The department offers work for the degrees Master of Engineering, Master of Science, and Doctor of Philosophy with major in aerospace engineering, and minor work to students taking major work in other departments. For all graduate degrees, it is possible to establish a co-major program with another graduate degree granting department. Within the aerospace department, work is available in the following areas: computational aerodynamics, fluid dynamics, and atmosphere and tornado sciences, control systems, atmospheric, and space flight mechanics, structural analysis, gasdynamics, turbulence, combustion, and swirling flow.

The major work for the degrees Master of Science and Doctor of Philosophy requires an acceptable thesis in addition to the course work. For the degree Master of Engineering, a comprehensive paper or suitable project as evidence of independent accomplishment is required. Appropriate credit is allotted for this requirement.

Minor work for aerospace engineering majors is usually selected from mathematics, physics, computer science, meteorology, and mechanical engineering.

The normal prerequisite to major graduate work in aerospace engineering is the completion of a curriculum substantially equivalent to that required of aerospace engineering students at this University. However, because of the diversity of interests within the graduate programs in aerospace engineering, a student whose prior undergraduate or graduate education has been in allied engineering and/or scientific fields may also qualify. In such cases, it may be necessary for the student to take additional work to provide the requisite background. A chosen area of interest. A prospective graduate student is urged to specify the degree program and the specific field(s) of interest on the application for admission.

Courses normally will be offered as stated in the course description. Where no specific time of offering is stated, the course may be offered during any semester provided there is sufficient demand.

The department also participates in the interdepartmental programs of Energy Systems Engineering, and Technology and Social Change. (See Index.)


Courses Primarily for Undergraduate Students

101. Introduction to Aerospace Engineering. (1-2) Cr. 2. F.S. Historical development in aeronautics and astronautics. Introduction to aerodynamics, aerospace structures and performance, and flight mechanics. A special laboratory may be offered for use of university aircraft.


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Agricultural Education

Harold R. Crawford, Head of Department

Professional: Crawford, Hoerner, Kahler, Lawrence, McClelland, Parsons, Williams

Emeritus Professor: Bundy

Associate Professor: Carter

Assistant Professor: Conner, Miller, Tred

Undergraduate Study

For undergraduate curriculum in agricultural education and agricultural extension education leading to the degree Bachelor of Science, see College of Agriculture, Curriculum.

The curriculum in agricultural education prepares persons for careers as vocational agriculture instructors, or as educational personnel in agricultural businesses, industries, and agencies. The curriculum in agricultural extension education prepares persons for careers as agricultural extension personnel.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with major in agricultural education and minor work to students taking major work in other departments. Candidates pursuing the Master of Science degree may do so by completing either a thesis or nonethesis program of study. Complete descriptions of these programs are available in the department.

The department cooperates with other departments in the College of Agriculture to offer work for a co-major Master of Science degree to prepare area school and community college agriculture teachers.

Prerequisite to major graduate work in agricultural education is preparation substantially equivalent to the completion of the undergraduate-curriculum in agricultural education or agricultural extension education offered at Iowa State University and adequate proof that the student ranks above average in scholastic ability and promise of vocational competence.

Off-campus courses are offered for professional personnel in the field. Three-week courses and workshops are offered during the summer sessions.

Courses Primarily for Undergraduate Students

110. Orientation in Agricultural Education. (1-0) Cr. F

111. Introduction to Agricultural Education. (1-0) 8 weeks. Cr. 0.5 F. S. Prereq: 110. Review of the agricultural teaching profession in secondary and post-secondary schools.

211. Survey of Vocational Agricultural Programs. (1-0) Cr. 1. F. Prereq.: 111. Admission to early experience program. Survey of programs of education in agriculture. Providing instruction on agricultural topics during the summer; includes scheduled workdays of full-time observation and supervised experience under the direction of an instructor of agriculture. Advanced registration required.

311. Coordinating SOE Programs and FFA in Vocational Agriculture. (4-0) Cr. 4. F. Prereq: 211. SOE and FFA program development Planning, organizing, coordinating and evaluating farm and off-farm occupational experiences and FFA activities in programs of agriculture.

312. Occupational Experiences. (0-4 to 0-12) Cr. 1-3 F. S. Prereq: 211 or 214. Supervised occupational experiences in agriculture with application of educational practices and principles.

314. Developing Comprehensive 4-H Youths Programs. (3-0) Cr. 3 S. Prereq: 214. Theory of 4-H program planning and development and the role of the 4-H leader, 4-H program implementation, and evaluation of educational programs.

316. Supervised Experience in County and Area Extension Program. 8 weeks. Cr. 8. F. S. S.

315. Seminar in Agricultural Education. (1-0) Cr. 1. F. S. Prereq: Junior classification. Offered on a satisfactory-fail basis only.


490. Independent Study in Agricultural Education. Cr. 1-3 S. S.

A. Secondary School
B. Business and Industry
C. Post-Secondary
D. Extension

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduate students.

500. Short Course in Agricultural Education. Cr. 1. Prereq: Permission of instructor. Specific problems, issues, and content areas in agricultural education. On and off campus on arranged basis.

511. Instructional and Organizational Problems of Beginning Teachers of Agricultural Education. (0-2) Cr. 1. F. S. Prereq: 417. Problems in instructional planning and methodology and in organizing the secondary, post-secondary, FFA, and agricultural experience programs. Offered on a satisfactory-fail basis only.


590. Special Topics in Agricultural Education. Cr. 1-3.

Prereq: 12 credits in agricultural education.

A. Curriculum
B. Methods
C. Philosophy
D. Evaluation
E. Administration
F. Leadership
G. Guidance

593. Workshop in Agricultural Education. Cr. 1-3 S. Prereq: 12 credits in agricultural education.

A. Curriculum
B. Methods
C. Evaluation
D. Administration
E. Leadership
F. Guidance

599. Creative Component. For nonthesis M. S. degree programs.

Courses for Graduate Students, major or minor


615. Seminar in Agricultural Education. (1-0) Cr. 1. F. S.
Agricultural Engineering

Howard P. Johnson, Acting Head of Department

Professors: Beer, Buchele, Giese, Hazen, Hoerner, Johnson, Laffin, Lovely, Marley, Melvin, Meyer, Pedersen, R. J. Smith, Van Fossen

Emeritus Professors: Beresorf, Hull, Morford, Roth

Associate Professors: C Anderson, Baker, Bern, Bundy, Erbach, Kline, Mangold, Soderholm

Assistant Professors: W R Anderson, Bekkum, Greiner, Nicholson, Ozkan

Instructors: Boyd, Chaplin, Everett, Glenville, Hoagland, Hurburgh, McCarthy, Shorter, Slocombe, Tevis, Vosper, Witcko, Williams

Undergraduate Study

For the undergraduate curriculum in agricultural engineering leading to the degree Bachelor of Science, see College of Engineering, Curricula

The curriculum in agricultural engineering provides training in the major fields of engineering applications to the industry of agriculture. Graduates from the curriculum find employment in agricultural production enterprises, in industries which supply goods and services to agriculture, and in the state and federal agencies responsible for agricultural engineering research, application, and education.

Employment for agricultural engineers is available in many agricultural industries. Professional services performed in the agricultural equipment industry include engineering design, development, manufacturing, product education, and sales. Services are rendered to industries supplying agricultural building materials and equipment, and in the design, construction, merchandising, and contracting of agricultural buildings.

Students may prepare for employment in design, development, construction, sales, and service in the areas of soil erosion control, drainage, and irrigation; rural electrification; crop processing and storage, materials handling in agriculture, and food engineering.

The department has cooperative programs established for interested and qualified students. The four-year curriculum is extended over a five-year period and interspersed with work periods at cooperating organizations. This plan offers valuable practical experience and financial assistance during the years in college.

The department offers an undergraduate curriculum in agricultural mechanization, see College of Agriculture, Curricula. The agricultural mechanization courses are offered for students in the College of Agriculture. These courses include areas of agricultural mechanics, soil and water management, power and machinery, electric power, farm buildings, animal environment, crop storage and processing, and agricultural safety.

Graduate Study

The department offers work for the degrees Master of Science, Master of Engineering, and Doctor of Philosophy with major in agricultural engineering and minor work to students taking major work in other departments. Minor work is also offered in agricultural mechanization for students in the College of Agriculture, see Agricultural Mechanization, Principles of agricultural mechanization. The major student may specialize in soil and water resources, agricultural power and machinery, electric power and processing, and agricultural structures and environment.

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that required of agricultural engineering undergraduate students at this institution. However, because of the diversity of interests within the graduate programs in agricultural engineering, a student may qualify for graduate study even though the undergraduate training has been in a discipline other than engineering. Supporting work will be required depending on the student's background and area of interest with requirements defined by departmental guidelines.

For the degree Doctor of Philosophy the foreign language requirement, or a substitute, may be satisfied in one of three ways: (1) Demonstrate a communication competence (ETS score of 600 on or 6 credit hours of 200 level) in one foreign language approved by the program-of-study committee. (2) Demonstrate a proficiency in FORTRANI computer language by course work (6 hours above Calculus S 172) or special examination. (3) Complete a minimum of six credits of additional course work not directly related to the major or minors. These courses are intended for the cultural enrichment of the student and are subject to the approval of the program of study committee.

The department also participates in the interdepartmental minor program in Energy Systems Engineering and in the interdepartmental programs in Technology and Social Change and Water Resources (see Index).

Open to graduate students for minor graduate credit only: 342, 371, 421, 422, 443, 444, 447, 463, 469, 471, 472.

Courses Primarily for Undergraduate Students

110. Seminar, (1-0) Cr. R. S. The field of agricultural engineering, its relation to the agricultural industry and to the engineering profession.

201. Agricultural Engineering Concepts I. (3-3) Cr. 4 F. 

192. Agricultural Engineering Concepts II. (3-3) Cr. 4 S. 

205. Philosophy and Policy Making in Agricultural Education. (3-0) Cr. 3. Alt. S., offered 1983. F. 

625. Administration Education. 

The field of agricultural engineering provides training in the major fields of engineering applications to the industry of agriculture. Graduates from the curriculum find employment in agricultural production enterprises, in industries which supply goods and services to agriculture, and in the state and federal agencies responsible for agricultural engineering research, application, and education.

The field of agricultural engineering offers valuable practical experience and financial assistance during the years in college.

The department offers an undergraduate curriculum in agricultural mechanization, see College of Agriculture, Curricula. The agricultural mechanization courses are offered for students in the College of Agriculture. These courses include areas of agricultural mechanics, soil and water management, power and machinery, electric power, farm buildings, animal environment, crop storage and processing, and agricultural safety.
Courses for Graduate Students, major or minor


460. Seminar. (1-0) Cr. 1-3 each yr. Discussion of research problems, methods, procedures, and reports.

469. Research. Cr. var.

Agricultural Mechanization

Administered by the Department of Agricultural Engineering

H. P. Johnson, Professor in Charge

Undergraduate Study

The Department of Agricultural Engineering offers courses for minor grade credit in agricultural mechanization for students taking major work in other departments.

Open to graduate students for minor credit only:

Courses for Undergraduate Students


269. Electrical Energy in Agriculture. (1-3) Cr. 2. S.S.S. Principles for students in the winter and spring farm operations programs. Basic electricity and electrical safety for agriculture. Wiring, electric controls, and motors.


326. Water Management in Rural Residential and Outdoor Recreation Areas. (2-0) Cr. 2. F. Development of prototype systems. Planning and management of small water disposal systems. Irrigation, drainage and erosion control considerations.


335. Tractor Power. (3-3) Cr. 4. F. Prepr. 3 credits of math, gasolene and diesel tractor engine construction and operational principles. Electical systems, drive and maintenance system. Operation and comfort.

350. Home Maintenance and Repair. (1-2) Cr. 2. F.S.S.S. A practical course for the potential homeowner and handyman. Emphasis placed on planning home improvements, basic skill development, using hand tools, wall and floor coverings, plumbing and use of building materials. Lab fee.


360. Agricultural Electricity. (2-3) Cr. 3. F. Basic electricity. Lighting design, electrical safety, wiring, electrical controls, and motors for agricultural application. Planning farmed electric distribution systems.

364. Crop Conditioning and Handling Systems. (3-3) Cr. 3. F. S. Principles, design, and management practices of grain drying and high-moisture crop preservation systems, with emphasis on corn. Grain handling, measurement, principles of machine performance, and cost analysis. Fee for field trip.

365. Metals and Welding. (2-4) Cr. 3. F.S.S.S. Basic gas and arc welding principles, procedures and applications in maintenance and construction. Selection of welding and cutting equipment for welding and open-air welding processes. Production welding problems, inspection and certification. Lab fee.

424. Drainage and Irrigation Management. (3-3) Cr. 3. S. Prepr: 3 credits of knowledge in drainage and irrigation management. Emphasis on basic principles, selection of equipment, agencies involved, and relationships to water use and control in agricultural production. Fee for field trip.

430. Farm Machinery Principles and Mechanics. (3-0) Cr. 3. F.S.S.S. Principles of operation of agricultural machinery. Study of mechanisms, forces, and strengths of machinery. Safety considerations in agricultural machinery.


540. Construction of Agricultural Structures. (1-4) Cr. 2. F.S.S.S. Prepr: 250. A combination of construction...


486. Teaching Agricultural Mechanics. (2:4) 8 weeks Cr. 2. S. Prereq: 280, 285. Organization and management of the agricultural mechanics instructional program, facility and equipment. Students plan and present demonstrations of teaching agricultural mechanics skills.


493. Engineering Principles for Food Technology I. (F Tch 493) See Food Technology.

494. Engineering Principles for Food Technology II. (F Tch 494) See Food Technology.

*Credit for both courses from each of the following pairs may not be applied toward graduation: 134 and 330, 144 and 350, 250 and 360, 273 and 473.

**Credit for 285 may not be applied toward requirements for a baccalaureate degree.

### Agricultural Studies

**Lee R. Kolmer, Dean of Agriculture**

**Extension, Research and Information Service**

Charles E. Donhoe, Dean of University Extension

**Professor: Donhoe**

**Emeritus Professors:** Graff, Souls, Taff

**Associate Professors:** Almquist, Goetttsch, Heer, Hegland, Hougen, Iverson, Johnson, Linstrom, Munster, Robb, Swenson, L. E. Thompson, Wallizer

**Assistant Professors:** Bogue, Ebert, Goering, Herrman, Kuiper, Lern, Mackey, McGimnis, Ransom, Wahnart

**Instructors:** Benn, Morris, Oelkers, G. O. Thompson

**Academic Programs**

Louis M. Thompson, Associate Dean

**Professors:** Kolmer, Scott, L. M. Thompson

**Assistant Professor:** Whigham

**Assistant Professor:** Bruene

**Instructors:** Poito, Swainston, Wilkens

Courses listed below are offered for undergraduate students in all curricula of the College of Agriculture. See also individual curricula in the section College of Agriculture.

**Courses Primarily for Undergraduate Students**

102. Freshman Seminar I. (2:2) 8 weeks Cr. 1 S. Selected topics in agricultural science. Orientation to academic life and university regulations. Guest speakers.

103. Freshman Seminar II. (2:2) 8 weeks Cr. 1 S. 1983. Preq. 102. Selected topics in agricultural science with emphasis on sources of information and the application of information. Guest speakers.

104. Practical Work. Cr. A Practical work in the student's field of study. See adviser for departmental requirements.

110. Orientation in Farm Operation. (1:0) Cr. R F. Description of the opportunities and scope of the farm operation curriculum. Assistance in the advising of those interested in the University and career planning. Also required in the Winter Program in Farm Operation.

290. Special Problems. Cr. 1 to 2. Prereq: Sophomore classification. Independent study for two-year farm operation students in a specific area in which no course is available and in an area not assigned to an existing department. Approved by the professor in charge of the farm operation curriculum.

450. Farm Operation and Management. (2:4) Cr. 3 F. S.S. Prereq: Ecom 390, Junior classification in the College of Agriculture. Participation in the management and operation of an Iowa farm. The class is responsible for the planning, records, and decisions of buying and selling of livestock, crops and equipment. Trips to farms and markets. May be taken for credit a second time at the different time of the year. Fee for field trips.

499. Independent Study. Cr. 1 to 2. Prereq: Junior classification in the College of Agriculture. Independent study of a specific area for which no course is available and in an area not assigned to an existing department. The proposal by the student is subject to the approval of the associate dean or the head of the farm operation curriculum.

999. Senior Seminar. (1:0) Cr. 1 F. S. Current topics of interest in agriculture. Assistance in career planning. Lectures by College of Agriculture staff and visitors.

### Agronomy

**John Pesek, Head of Department**


**Emeritus Professors:** Browning, Duncan, Kirkham, Pierre, Riecken, Schaller

**Associate Professors:** Campbell, Dumenil, Miller, Takie, Whigham

**Assistant Professors:** P. F. Anderson, Bamhart, Blim, Blackmer, Ciancio, Crusie, Cruse, Eik, Englehom, Hansen, Henning, Loyanahan, Mullen, Nicholson, Smith, S. E. Taylor, M. L. Thompson, Vaughan

**Instructors:** Barnett, James, Ziegler

### Undergraduate Study

For undergraduate curriculum in agronomy, see College of Agriculture, Curricula.

Students electing agronomy as a major will prepare themselves for positions in farming, agricultural industry, business, and government agencies. Graduates accept positions in the seed, fertilizer, and chemical industries as agronomists, production managers, and sales and promotion personnel. State and federal agencies employ agronomists as extension specialists, county extension directors, soil scientists, soil conservationists, and food and drug inspectors. Land appraisal, farm management, turfgrass management, and pest management and crop protection are additional areas of work open to agronomists. Students interested in pest management and crop protection should consider taking pest management as a second major (see Pest Management, Curricula). Students who are reasonably certain of going on to graduate school should elect the agronomic science specialty.

### Graduate Study

The department offers work for the degrees of Master of Science and Doctor of Philosophy, with majors in crop production and physiology, plant breeding and cytogenetics, soil physics, soil chemistry, soil fertility, soil microbiology and biochemistry, soil morphology and genesis, soil management, and agricultural climatology.

Minor work is provided for students with majors in other departments. An M.S. nonthesis option is available for students desiring to pursue a special project not involving thesis research. The M.S. nonthesis requirement is completion of 34 hours of graduate credit, which must include 4 hours of creative component (Agron 599). Submission and approval of a report on the special project undertaken, and satisfactory completion of a final oral examination.

The department also cooperates in the interdepartmental programs of Immunobiology, Molecular, Cellular and Developmental Biology, Technology and Social Change, and Water Resources. (See Index.)

Prerequisite to major work in this department is completion of an undergraduate degree program with emphasis on biological and

Courses Primarily for Undergraduate Students

110. Orientation in Agronomy. (1-0) Cr. R

Open to graduates for minor credit only. 315, 354, 364, 406, 412, 415, 421, 453, 454, 457, 473, 483, 485.

315. Turfgrass Establishment and Management. (Hort 251) S

354. Soil Fertility (2-3) Cr. 3 F S Alt SS, 1983 Prereq 154, 2 chemistry courses or those of Loyanich Chemical, biological, and physical properties of soils in relation to plant growth and soil behavior. Examines the artificial evaluation principles - guiding use of lime, manure, and fertilizers

357. Forest Soils. (For 357) (2-3) Cr. 3 F Soil Chemists, classification and distribution of soils. Properties and processes of forest soils in relation to forest growth


371. Intercollegiate Soil Judging. (0-3 to 5) Cr. 1 to 4 or 1 each time taken. 1 additional credit for participants in regional or national contests. F. Prereq Permission of instructor. Teamwork and classification of soil by examination of soil profiles in the laboratory and on field trips. Determination of soil texture, structure, color, and other properties. Fee charged for out-of-town field trips.

400. Agricultural Travel Course. Cr. 3 S. Prereq Junior or senior classification. Permission of instructor. Limited enrollment

A. American Tour, offered 1983 B. International tour, offered 1982

Students taking this course will also be required to register for Animal Science 400 for 3 credits. Tour and study of production methods in major crop and livestock regions of the United States and other countries. Influence of climate, soil, topography, water, and other factors on livestock and crop production. Tour will be conducted by the student.

406. Climate of the Continents. (Meteor 406) (2-0) Cr. 2-3 S Prereq Aeron Mteor 206 Shaw. The major climate controls and how they affect the world climate. Climate classification. Combining controls and classification to explain the climate of different continents and the world

411. Seminar. (1-0) Cr. 1 F. Prereq Senior classification. Pestek and staff. A study of technical, economical, and ecological aspects of pest management. Students will understand different methods of pest control. Pest control methods and practices used in the world and their impact on the environment.

206. Introduction to Meteorology. (Meteor 206) (2-0) Cr. 2 F. Prereq Introduction to basic meteorological processes. The general circulation, solar and terrestrial radiation, fronts, cyclones and anticyclones, weather maps, and forecasting.

212. Grain and Forage Crops. (3-2) Cr. 4 S. Prereq 114 George. Crop plant characteristics, adaptation, and quality with emphasis on the production and management of com, soybeans, small grains, and forage crops common to the Midwest agriculture.


237. Seed Production. (PP SW 237) (1-2) Cr. 2 F Prereq 154, 114 or 221 Mullen. Study of major seed production areas, environmental and physiological production, and management of seed crops. Fees for field trips.

238. Seed Technology. (PP SW 238) See Plant Pathology, Seed and Weed Sciences.


244. Soil Fertility and Crop Management. (2-0) Cr. 2 S. Prereq 114 or 119 or 191 Prereq. For two-year operation students only. Integrating soil fertility and crop management principles and practices into profitably operated systems. Emphasis on education of farmers and agricultural extension. Presentations from various agronomy-related disciplines are involved

311. Seminar. (2-0) Cr. 1 F. Prereq. Second semester junior or first semester senior classification. Staff: Career planning, resume preparation, interviewing and job opportunities. Emphasis on dissection and comparison of various agronomy-related disciplines are involved.

318. Principles of Crop Physiology. (3-0) Cr. 3 F. Prereq. Bot 310 or 320. Pearce.

Basic principles of crop growth, development, and production of crop communities, including their response to environmental factors. Historical aspects and legal considerations will be covered

340. Chemical Use in Crop Production and Soil Management. (P M 340). (3-0) Cr. 3 F. Prereq. Course in organic chemistry. Pearce, Managerial, physiological, and ecological effects of chemicals applied to crops and soils. Includes pesticides, growth regulators, soil stabilizers, and nitrification inhibitors. Farmers will not be included. Types of formulations, proper application, economic aspects, historical aspects, historical aspects and legal considerations will be covered

483. World Soil Resources. (2-0) Cr. 2 S. Prereq. Chem 163 (154 recommended). Schafr. Properties, classification and geographic distribution of soils with emphasis on their suitability for food production.

485. Soil Biology. (Micro 485). (2-3) Cr. 3 F. Prereq 154, Mcll. Soil bacteria. Description of organisms in the soil and plant environment, and their role in organic matter decomposition (including natural materials and man-made chemicals and wastes), nitrogen fixation and transformations, and diseases which directly or indirectly affect people.

490. Independent Study. Cr. Can be used to graduate students, after consultation with professor in special area of interest. Selected studies in crops, soils, or climatology according to needs and interests of student. H. Honors

*Credit for only one course from the following may be applied toward graduation 154, 156, or 357

Courses Primarily for Graduate Students, Major or Minor to qualify for undergraduate

500. Orientation Seminar. (2-0) Cr. 1 F. Prereq Graduate classification in agronomy, and from foreign or domestic. Prereq and staff or both and students to Iowa and University for international students. Field trips when possible. Departmental role in the functioning of research, teaching, and extension in fulfilling the charge given by the University.

505. Microclimatology. (Meteor 505) (2-0) Cr. 2 F. Prereq Agron Mteor 206 Shaw. The heat exchange near the ground. Radiation, turbulence, conduction and evaporation and components of the heat balance. Temperature, wind and humidity conditions in the microclimate. Modification of the microclimate.


516. Crop Physiology and Management. (2-0 or 3-0) Cr. 2 or 3 S. Prereq Bot 320, Schie. Anderson Physiology of crop growth, development, and productivity. Application of physiological and ecological principles to crop culture and management. Students may elect physiology only (10 wks, 2 cr.) or the full topic (20 wks, 3 cr.)


522. Field Methods in Plant Breeding. (2-0 or 2-6) Cr. 2 S. Prereq. 521. Field experience in planning and conducting plant breeding research for cross-pollinated and self-pollinated systems. Duration of a satisfactorily-failed basis only. Fee for field trips.

529. Cytogenetics in Plant Breeding. (2-0 or 2-3) Cr. 3 Alt F. offered 1981. Prereq 521, Gen 507, 625. Peterson. Chromosome recombination, principles of chromosome pairing, gene distribution, within the genome, intervarietal, aberrations, polyplody, genome relations, aneuploids, nullisomic analysis, interspecific hybrids, cell fusion, evolution of the nucleotide, repetitive DNA, the eukaryotic genome, and emergence techniques for the genetic improvement of crops

534. Forages: Management and Utilization. (2-0) Cr. 2 F. Prereq. 212, An 319. Wodin. Forage (h1 handmade and trad) principles and practices leading to economic utilization systems. Emphasis on soil, animal management and grazing and role of ruminants as forage converters.

Courses for Graduate Students, major or minor


609. Agricultural Climatology Conference. (6-0) Cr. F and S. Credit no more than 9 hours. F.S. Carlson. Shown. Literature reviews and conferences on selected topics in crops, soils, or climatology according to needs and interest of student.


556. Laboratory Methods in Soil Chemistry. (2-0) Cr 3. F. Prereq. 211 Tabatabaie. Experimental and descriptive inorganic and organic analysis. Operational theory and principles of applicable instruments, including spectrophotometry, atomic and molecular absorption, emission spectrophotometry, mass spectrometry, x-ray diffraction and fluorescence, gas and ion chromatography, and specific-ion electrodes.


575. Soil Morphology, Genesis and Classification. (3-0) Cr 3 F. Prereq. 211, 213, 553. Morphology and formation of soils, systems of classification and geographical distribution of soils.

577. Soil Physics. (2-0) Cr 2 F. Prereq. 354. Math 165 recommended. Relation to physical properties of soils to plant growth, particle size distribution, soil structure, clay minerals, soil moisture, soil air, and soil temperature.

578. Laboratory Methods in Soil Physics. (1-3) Cr 2 S. Prereq. 577. Methods of measuring soil physical properties such as texture density, porosity, and water content, and transport of heat, water, and gases.


590. Special Topics. Cr arr. Prereq. 15 credits in agronomy. Literature reviews and conferences on selected topics in crops, soils, or climatology according to needs and interest of student.

599. Creative Component. Cr arr. Prereq. Nonthesis M.S. option only. Written report based on research, library readings, or topics related to the student's area of specialization arranged by the student's advisory committee.

A. Agricultural Climatology B. Crop Production and Physiology C. Plant Breeding and Cytogenetics D. Soil Chemistry E. Soil Fertility F. Soil Management G. Soil Microbiology and Biochemistry H. Soil Morphology & Genesis I. Soil Physics

Air Force Aerospace Studies

Graham F. Crow, Head of Department

Professor: Crow

Associate Professor: Dotson

Assistant Professors: Deterle, Hart

Undergraduate Study

The objective of Air Force Aerospace Studies is to provide qualified students the opportunity to serve as officers in the active Air Force, the Air National Guard, or the Air Force Reserve.

The curriculum is divided into two basic phases, the general military course (GMC) and the professional officer course (POC). The GMC is introductory and consists of four consecutive 1-hour courses normally taken during the first 2 years of college. The POC is not prerequisite to entry into the POC, although it is recommended by the department.

Prior to entry into the POC, all students complete field training at an Air Force base. Students who have completed the GMC participate in a 4-week program, which provides a concentrated experience in the Air Force environment. The training program includes junior officer training, aircraft and aircrew orientation, field training, survival training, base functions, and physical training. A 6-week training program is provided for those students entering the POC who did not take the GMC. This program includes all that is offered in the 4-week program, plus the academic and leadership laboratory experiences normally contained in the on-campus GMC courses.

Selection for the professional officer course is on a competitive basis, and cadets enrolling in this course must meet certain academic, mental, physical, and moral standards. Qualified cadets may elect classification as flight candidates and receive flight instruction during their final year in the POC. Upon enrollment in the POC, all cadets are required to complete a contractual agreement with the Air Force, which obligates them to 4 years of active duty as an officer in the United States Air Force if in a nonflying category, and up to 7 years if a pilot or navigator. Uniforms and texts are supplied to the cadets and those in the POC receive a subsistence allowance of $100 per month.

Entry into the program is not dependent on departmental major or year in the university. A 2-year applicant must, however, spend 2 years as either an undergraduate or graduate student in approved programs in order to satisfy POC enrollment requirements. A student who fails to observe the contract terms may be called to active duty in an enlisted grade.

The best qualified cadets participate in a college scholarship program (CSP) that provides payment of full tuition, fees, and textbooks. In addition, the CSP cadets receive the $100 monthly subsistence allowance paid all cadets who have entered into the contractual agreement. Upon acceptance of a scholarship, the CSP student executes a contract with the United States Air Force. The scholarship can be awarded for periods of 2, 3, or 4 years. To determine the eligibility and initiate application procedures for the scholarship program, interested students should contact the department.

All GMC scholarship cadets must successfully complete or test out of a course in English composition. POC cadets must successfully complete a course in mathematical reasoning prior to graduation. In order to satisfy POC enrollment requirements, students must enroll in the AFROTC program. Students entering the AFROTC program are encouraged to take a speech course.

The AFROTC program is open to both male and female students. Applications from qualified female candidates are encouraged. Additional information concerning Air Force Officer Education may be obtained from the Professor of Aerospace Studies, Iowa State University. See also Office Education.

Courses Primarily for Undergraduate Students

141, 142, The United States Air Force Today. (1-0) Cr 1 each. Yr. Development of the Air Force, its functions and organization; emphasis on functions of U.S. strategic offensive, defensive, and special purpose forces, relationships and interaction with Army and Navy forces. Review of writing skills.
American Indian Studies


The American Indian studies program is a cross-disciplinary program in the College of Sciences and Humanities, which offers an opportunity to learn more about the cultural heritage of American Indians, their historical relationship with non-Indians, and their participation in contemporary American society. This program serves both American Indian and non-Indian students and emphasizes perspectives from anthropology, history, literature, and sociology.

The courses in the American Indian studies program provide added background for students whose career interests may include multicultural education, human services programming, legal services, or public administration.

Within the College of Sciences and Humanities, courses in American Indian studies can be used in planning an area of concentration in a distributed studies major, in a minor, or as components in an individual major, or as electives. Students majoring in another college who wish to use these courses should consult their advisors.

A minor in the College of Sciences and Humanities must include at least 15 credits of courses in the field. A minor in American Indian studies must also include 210, 322 or 332, and at least two additional courses from a selected list of primary courses. The American Indian studies program committee will, upon application by the student and review of the program, certify that the student has completed a minor in American Indian studies.

American Indian studies courses may be offered in an approved American Indian studies department, or by other departments as part of an interdisciplinary major program. An individual major consists of course work from various departments designed to reflect the student's particular interests and goals. For details see: Sc7ences and Humanities Cross-Disciplinary Studies.

Courses Primarily for Undergraduate Students

210. Introduction to American Indian Studies (3-0) Cr. 3
F. Introduction to the multidisciplinary aspects of American Indian studies. Guest lectures, media presentations, and discussion of assigned readings. A major term paper or project expected, based on area of particular interest, i.e., literature, art, history, anthropology, sociology, education, contemporary Indian politics.

310. Selected Topics in American Indian Studies (3-0) Cr. 3
This course is offered by the department chairman. Students interested in pursuing a topic of special interest should consult the department chairman to arrange the course.

450. Independent Study Cr. Var. Prereq: 6 credits in American Indian studies. Designed to meet the needs of students who wish to study areas other than those in which courses are offered.

Primary Courses (Cross-listed)

322. The American Indian. (Anth 322) See Anthropology
323. Contemporary Latin American Cultures. (Anth 323) See Anthropology
332. Contemporary Native Americans. (Anth 332) See Anthropology
346. American Indian Literature. (Engl 346) See English
420. Archaeology of North America. (Anth 420) See Anthropology
520. Cultural Continuity and Change in the Prairie-Plains. (Anth 520) See Anthropology
522. Seminar on American Indians. (Anth 522) See Anthropology

Primary Courses (Departmental)

Hist 370. History of Iowa. See History
Hist 465. The Westward Movement and Frontier Development. See History
Soc 300. Ethnic and Race Relations. See Sociology
Soc 529. Minority Groups. See Sociology
Anth 428. Archaeological Laboratory Methods and Techniques. See Anthropology
Anth 429. Archaeological Field School. See Anthropology

Animal Ecology

Robert C. Summerfield, Chair of Department

Professors: R. W. Bachmann, Cardiner, Dahlgren, Klaus, Menzel, Moorman, Summerfield

Associate Professors: Atchison, M. D. Bachmann, Best, Dinsmore, Nickum

Assistant Professors: Clark, Franklin, Hubert

Undergraduate Study

The department offers work for the degree of Bachelor of Science with majors in animal ecology and in fisheries and wildlife biology (see College of Agriculture, Curriculum)

The animal ecology curriculum provides its majors with an understanding of basic ecological principles and processes. It is oriented toward students desiring a general and flexible program in environmental biology, and for those planning graduate work in ecology.

The student, upon consultation with the academic adviser, may select courses in such areas as water pollution biology, population ecology, aquatic ecology, terrestrial ecology, nature interpretation, and environmental problems. Graduates may find employment as ecologists for industry, environmental consulting firms, government agencies or as environmental protection administrators, and with supplemental education as teachers.

The fisheries and wildlife biology curriculum includes broad study of vertebrate biology and ecology as a basis for research and management of wildlife resources. Special interests may be pursued through elective courses and summer employment. Most employment opportunities in fisheries and wildlife biology are with government agencies.

Grades are prepared for students as fisheries or wildlife biologist, conservation officer, park naturalist, hatchery or game farm technician, or ecological survey technician.

Both curricula require either three months of relevant work experience or study at a summer biological station prior to graduation. The latter may be accomplished at the University's affiliated facilities, Iowa Lakeside Laboratory at West Lake Okoboji, Iowa, and Gulf Coast Research Laboratory at Ocean Springs, Mississippi. Information on these laboratories is available from the department chairman.

The department cooperates with the pest management program, and majors in both curricula may take a secondary major in this area.

Preventive preparation may be accomplished while satisfying degree requirements in animal ecology.

Additional education and training can lead to other opportunities in the fields of research and management biology, natural resources planning and administration, teaching, and environmental consulting, among others.

Graduate training is necessary for an increasing number of specialized positions within the fields of animal ecology, wildlife biology, and wildlife biology majors preparing for graduate study should consult with their academic advisers concerning appropriate coursework.

Graduate Study

The department offers work for the degrees of Master of Science and Doctor of Philosophy with majors in animal ecology, fisheries biology, and wildlife biology. Within these majors, the student may also specialize in animal behavior, ecology, immunology, or taxonomy.

The Ph.D. degree requires proficiency in one foreign language. This may be demonstrated by one year of college credit with a minimum average of 2.0 (on a 4.0 - A scale), by an Educational Testing Service Foreign Language Examination score of at least 500, or by committee approval of equivalent language experience. The student's committee may require additional language competence.

Personnel of the U.S. Fish and Wildlife Service, through the Iowa Cooperative Fishery and Wildlife Research Units, and the Iowa State Conservation Commission contribute to the graduate program of the department. The department participates in the interdisciplinary graduate program in Water Resources (see Index).
Courses Primarily for Graduate Students

110 Orientation in Animal Ecology. (2-0) Cr. 1 F
Orientation to the majors and career opportunities in animal ecology.

130. Wildlife and Agriculture. (2-4) Cr. 2 F. Survey of the ecology and management of fish and wildlife resources in areas of intensive agriculture, with emphasis on Iowa wildlife conservation and management practices for private agricultural enterprises. Designed for non-majors.

231 Wildlife Resource Conservation. (3-0) Cr. 2 S Prereq. 109 or 110 Biological principles and basics of fisheries and wildlife conservation and resource management.

300 Seminar. (2-0) Cr. 1 each time taken, may be taken more than once for graduation credit. F S Prereq Permission of instructor. Current topics in animal ecology, fisheries and wildlife biology, and environmental issues.

312. Ecology. (Biol 312) See Biology

320 Vertebrate Biology. (2-0) Cr. 2 F Prereq. Biol 110 Introduction to evolution and biology of vertebrates fish, amphibians, reptiles, birds, mammals, and invertebrates.

320L. Vertebrate Biology Laboratory. (0-3) Cr. 1 F Prereq Credit or classification in 320 Introduction to classification and identification of vertebrates fish, amphibians, reptiles, birds, mammals.

321 Ichthyology. (2-4) Cr. 4 S Prereq. 320L Biology, classification, and identification of major freshwater and marine fish groups Field trips

322 Herpetology. (2-3) Cr. 3 Alt S offered 1982 Prereq. 320L Biology, life histories, classification, and identification of amphibians and reptiles Field trips

323 Mammalogy. (2-6) Cr. 4 F Prereq. 320L Ecology, natural history, identification, and classification of mammals with emphasis on how mammals adapt to and interact with their environment Field trips

324 Ornithology. (1-3) Cr. 2 S Prereq. 320L Ecology, behavior, and physiology of birds

325. Bird Study. (0-3) Cr. 1 S Prereq. 320L Identification and identification of birds emphasizing midwestern species Field trips

350 Wildlife Techniques and Habitat Analysis. (1-3) Cr. 2 S Prereq. 231, 320L Techniques and methods used in research and management of wildlife with emphasis on inventory and manipulation of wildlife populations and habitat Field trips

410 Limnology. (2-0) Cr. 2 F Prereq. 10 credits in biological sciences or graduate classification. Structure and function of aquatic environments with application to fishery and pollution problems

440 Fishery Management. (2-0) Cr. 2 F Prereq. 231, 320L Biological basis of fishery management

441 and Limnological Techniques. (0-6) Cr. 2 F Prereq. Credit or classification in 410 or 440 or 510 Field and laboratory methods used in fishery and limnological studies Field trips

451. Wildlife Management. (2-3) Cr. 3 F Prereq. 312, 292 Basic principles of managing wildlife populations Fee for field trips

490 Independent Study. Cr. arr. F S Prereq. 10 credits in biological sciences and permission of instructor. Student-initiated field, laboratory, or library project

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Seminar. (2-0) Cr. 1 each time taken, may be taken more than once for graduation credit. F S Prereq Permission of instructor. Graduate colloquia

Current topics in ecological research, fish and wildlife management, and environmental problems related to fish or wildlife resources. Fee charged for sections requiring field trips

510. (410 DL) Limnology. (2-0) Cr. 2 F Prereq. 10 credits in biological sciences. Graduate study in conjunction with 410 Additional work required for graduate credit. Not available for credit for students having taken 410

511. Population Ecology. (3-0) Cr. 3 S Prereq. 312, Stat 401, a course in calculus. Theories and concepts of animal population dynamics and regulation with emphasis on the analysis of biological populations

512. Vertebrate Behavioral Ecology. (Zoo 512) (3-0) Cr. 3 Alt F. offered 1982 Prereq. 320L Recommended. Selected topics in behavior considered relative to environmental influences and ecological concepts. Includes predation, foraging, spacing, reproduction, and social behavior

513. Pollution Ecology. (3-0) Cr. 3 Alt S, offered 1983 Prereq 312 Ecological relationships between aquatic and terrestrial organisms and environmental pollutants. Aspects of source, occurrence, persistence, toxicity, ecosystem dynamics, and rate of degradation of pollutants

514. Evolutionary Ecology. (4-0) Cr. 3 S Prereq. 312, Biol 303, Gen 320L Recommended. Relationships between animals and their environment, with major emphasis on adaptive strategies and evolutionary mechanisms

520. Fish Ecology. (3-0) Cr. 3 Alt F. offered 1981 Prereq. 312, 321 Ecological interrelationships of fish communities in North American lakes and streams Emphasis on habitat and reproductive ecology, and community structure

521 (321 DL) Ichthyology. (2-4) Cr. 4 S Prereq. 320L Graduate study in conjunction with 321 Additional work required for graduate credit. Not available for credit for students having taken 321

522 (322 DL) Herpetology. (2-3) Cr. 3 Alt S, offered 1982 Prereq. 320L Graduate study in conjunction with 322 Additional work required for graduate credit. Not available for credit for students having taken 322

523 (323 DL) Mammalogy. (2-6) Cr. 4 F Prereq. 320L Graduate study in conjunction with 323 Additional work required for graduate credit. Not available for credit for students having taken 323

524 (324 DL) Ornithology. (1-3) Cr. 2 S Prereq. 320L Advanced study with 324 Additional work required for graduate credit. Not available for credit for students having taken 324

531. Wildlife Planning, Policy, and Administration. (3-0) Cr. 2 Alt F. offered 1981 Prereq. A course in natural resource management, with an emphasis on wildlife administration, and modern methods for planning and implementing management policy. Field trips with particular emphasis on resource management in public or private agencies dealing with natural resources

541. Fish Culture. (2-3) Cr. 3 Alt S offered 1983 Prereq. 231, 320L Principles and techniques of fish propagation, hatchery management, water quality, and disease problems. Fee charged for field trips

543 Advanced Fishery Management. (2-3) Cr. 3 F Prereq. 321, 410, 440, 441 Survey and evaluation of principles and techniques used in research and management of fishery resources. Fee charged for field trips

551 Wildlife Sociology and Management. (2-2) Cr. 3 Alt S. offered 1982 Prereq. 312, a course in wildlife management, with an emphasis on the social, economic, and political reasons for wildlife management. Field trips

590 Special Topics. Cr. arr. F S Prereq. Graduate classification, permission of instructor

Courses for Graduate Students, major or minor

600 Seminar. (2-0) Cr. 1 each time taken. Sectional work. Fee charged for sections requiring field trips

610 Advanced Limnology. (2-3) Cr. 3 S Prereq. 410, 510, 441, Stat 401. Physical, chemical, and biological processes of lakes and streams and their relationships to biological productivity, ecological succession, and water quality. Limnological research techniques. Field trips

640. Fishery Resources and Research Techniques. (3-3) Cr. 4 Alt F. offered 1982 Prereq. 440, Stat 401. Major fishery resources and how they have been studied and managed. Critical analysis

650. Advanced Wildlife Management. (2-3) Cr. 4 Alt F. offered 1982 Prereq. 320L Advanced treatment of ecology and management of upland birds and mammals, ungulates, large carnivores, shorebirds, waterfowl, and selected fur-bearers. Fee charged for field trips

699. Research

*Courses Offered at the Iowa Lakeside Laboratory

320L. Field Biology. (4-12) Cr. 3 S. Animals in the field, with particular emphasis on their recognition and behavior, intensive observing, and laboratory culture methods. Fee charged. Must be taken concurrently with Bot 301L.

508L. 509L. Aquatic Ecology. (8-24) Cr 5 each SS Survey of local aquatic communities and aquatic habitats, analysis of physical, chemical, and biological factors. Emphasis on field work, methodology, and basic ecological principles. Field trips

**Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi.

412G. (ZO 452) Marine Ecology. Cr. 4 S Prereq. Courses in general botany, vertebrate zoology and analytical chemistry. A consideration of the relationship of marine organisms to their environment, including the effects of temperature, salinity, light, nutrient concentration, currents, and food on their abundance and distribution

442G. (ZO 442) Marine Fisheries Management. Cr 4 A general course in fisheries management designed to acquaint students with the philosophy, objectives, problems, and principles involved in management decisions. Lectures will include specialists in biology, fisheries statistics, sanitation, and marine law.

443G. (ZO 464) Marine Aquaculture. Cr 6 Prereq. general zoology or vertebrate zoology. A lecture, laboratory, and field course designed to introduce aquatic and marine biology students to the history, principles, problems, and procedures relating to the culture of commercially important crustaceans, fish, and mollusks along the Gulf Coast

*Written permission of the instructor is prerequisite to all courses offered at the Iowa Lakeside Laboratory. For current information concerning courses, registration, and housing, see the annual Iowa Lakeside Laboratory Bulletin. This bulletin is usually available from participating departments after February 15.

**Written permission of the coordinator of the Gulf Coast Research Laboratory, 201 Bessie Hall, Iowa State University, Ames, Iowa, 50011 is prerequisite to all courses offered at the laboratory. Numbers beginning with ZO are GCRL numbers. Courses offered may vary from year to year.

Animal Science

S. A. Ewing, Head of Department


Emertius Professors: Arnold, Berdeston, Lee, Malamphy, Porter

Associates Faculty: Berger, Brant, Ford, Haaslen, Holden, Kenealy, Olson, Rouse, Sebranek, Spikc, Strohben

Assistant Professors: Kemer, Rothschild, Russell

Instructor: Amundson

Undergraduate Study

For undergraduate curricula in animal science and dairy science, see College of Agriculture, Curricula.

The department offers the degrees Bachelor of Science in animal science, Bachelor of Science in dairy science, and complementary work toward admission to schools of law, medicine,
and veterinary medicine in either curricula. This may be done while satisfying requirements for the degree Bachelor of Science in animal science or dairy science (see index).

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with majors in animal breeding, animal nutrition, meat science, muscle biology, nutritional physiology, poultry nutrition, poultry products technology, physiology of reproduction, and molecular, cellular and developmental biology. Minor work is included in these areas to students taking major work in other departments. For students desiring more general training, the degree Master of Science is offered in animal production. In this program, additional course work may be substituted for a thesis.

A strong undergraduate program is required for those students interested in graduate study. Fundamental training in biology, chemistry, mathematics, and statistics is requisite to a satisfactory graduate program. Graduate programs in animal science include supporting work in areas such as agronomy, anatomy, bacteriology, biochemistry, chemistry, economics, food technology, genetics, physiology, and statistics. Students may choose graduate programs involving a co-major with one of these areas. Graduate work in meat science is offered as a co-major in animal science and food technology.

The department also cooperates in the interdepartmental program of immunobiology (See Index).

The foreign language requirement, if any, is established on an individual basis by the program-of-study committee appointed to guide the work of the student.

Open to graduate students for minor credit only 318, 319, 331, 352, 353, 360, 370, 415, 420, 423, 425, 427, 428, 429, 434, 436.

Courses Primarily for Undergraduate Students

101. Animal Production (5-0) 8 weeks. Cr. 3 S. For Winter Program in Farm Operation only. Farm animals in agriculture, the application of production, evaluation, and marketing techniques. Includes live animal demonstrations with cattle for meat and milk, horses, poultry, sheep, and swine.

110. Orientation in Animal Science (1-0) Cr. F Orientation to the University and Department of Animal Science.

114. Survey of the Animal Industry (3-0) Cr. 3 F.S.S. Breeds, basic management and marketing of farm animals. Composition, evaluation, and marketing of animal products. Includes live animal demonstrations with cattle for meat and milk, horses, poultry, sheep, and swine.


218. Feeds and Feeding. (3-0) Cr. 3 F.S. For offered in animal or dairy science. Nutritional principles, digestive systems, composition and nutritional characteristics of common feedstuffs, ration formulation, and recommended feeding programs for farm animals. Credit for both 218 and 219 may not be applied toward graduation.

225. Livestock Heritage. (3-0) Cr. 3 S An historic chronology of the influence of livestock on cultural evolution. Comparative species heritage. Contribution of livestock to the humanities.


315. Horsemanship and Equitation. (3-4) Cr. 2 F. Fitting and training of light horses and ponies. Training for English and Western equitation and horsemanship. Fee for field trips. Lab fee.

318. Fundamentals of Nutrition. (3-0) Cr. 3 F.S.S. Prereq. Organic chemistry or B 221, physiology recommended. Sources of nutrients, their role in metabolism of carbohydrates, fats, proteins, minerals, and vitamins. Measures of energy.

319. Applied Animal Nutrition. (3-0) Cr. 3 F.S. Prereq. 318. Essential nutritive requirements of livestock and poultry, sources of nutrient, and composition of nutrients in feeds. Replacement value of feeds in rations, ingredient value of feeds in rations, ingredient identification, ration formulation, and feeding recommendations. Credit for both 318 and 319 may not be applied toward graduation.


352. Livestock Improvement Through Artificial Breeding. (2-3) Cr. 4 F.S. Prereq. Course in genetics recommended. The genetic and environmental bases of animal differences. Selection and mating systems as mechanisms for genetic change. Designing breeding programs for economically important traits. Selection in a simulated breeding herd.


400. Agriculture Travel Course Cr. 3 S. Prereq. Junior or senior classification. Limited enrollment. American Tour, offered 1983 B International Tour, offered 1982. Students taking this course will also be required to register for Agron 400 for 3 credits. Trip and study of production methods in major livestock and crop regions of the United States and other countries. Influence of climate, soil and cultural practices on livestock and crops produced. Tours expenses paid by the student.

410. Job Selection and Interviewing. (1-0) Cr. F Prereq. Seminar organized in animal or dairy science. Seminar course designed to inform students of the professional areas in animal sciences and other agribusiness industries in which they may find employment opportunities. Resume preparation and interviews.

415. Horse Production. (2-2) Cr. 3 S. Prereq. 319 or 210. 352. Principles and concepts of horse genetics, breeding, reproduction, nutrition, behavior, training, stallion management, and marketing. Application of these concepts in pleasure horse production and use. Fee for field trips. Lab fee.


423. Poultry Production. (2-2) Cr. 3 S. Prereq. 319 or 218, 332. Practical feeding and management of chicken and turkey flocks. Operational study of commercial farms, including production and marketing techniques.

425. Pork Production. (2-2) Cr. 3 S. Prereq. 319 or 218, 352. Life-cycle swine production. Fee for field trips.

427. Beef Production. (2-2) Cr. 3 F.S. Prereq. 319, or 352. The beef industry. Principal emphasis on cow-call operations. Postweaning production systems. Fee for field trips.

428. Cattle Feedlot Management. (2-3) Cr. 3 F. Prereq. 319, 252. Preconditioning, selection and handling climatic control and environmental influences, facilities, waste management, health and diseases, nutrition and feeding program production costs, marketing and carcass evaluation. Fee for field trips.

429. Lamb and Wool Production. (2-2) Cr. 3 S. Prereq. 319 or 218, 352. Calendarized farm flock program. Programs for feeder lambs. Fee for field trips.

430. Milk Production. (4-0) Cr. 3 F.S. Prereq. 319 or 218. Economic concepts of dairying, selection, feeding, management of the milking herd. Nutritional relationships in milk secretion. Raising herd replacements.

434. Dairy Enterprise Planning. (2-2) Cr. 3 S. Prereq. 319. Independent development of dairy production systems, cost analysis, budgets, and labor requirements. Fee for field trips.


476. Meat Animals and Horses.

477. Beef Cattle.

478. Dairy Cattle.

479. Meats.


481. Poultry Science.

482. Honors Program.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates.

500. Computer Techniques for Biological Research (2-2) Cr. 3 S. Prereq. Stat 401 Development of computer programs for solving problems. Constructing algorithms and organizing data for statistical program libraries.

503 Seminar in Animal Production (1-0) Cr. F. Prereq. Permission of instructor. Discussion and evaluation of current topics in animal production and management.


Protein (2-0) Cr
Prereq
550 Population and function of the reproductive system and nutrition with these processes: gametogenesis, estrous
Permit
F Biology (2-2) Microscopic structure of muscle tissue.
C concepts for swine and
H Development of end-products absorbed from tract
A
B
Genetics Concepts of a
K mammalian protein metabolism
Integration of biochemistry and
S Study of current literature and current investigations

Courses for Graduate Students, major or minor.
603 Seminar in Animal Nutrition (1-0) Cr R F S Prereq Permission of instructor. Discussion of current literature, preparation and submission of abstracts
610 Ruminology (3-0) Cr 3 Alt S, offered 1982 Prereq Permission of instructor. Anatomy and physiology of the ruminant digestive tract. Description and interpretation of ruminal microbes and intestinal microbes. Utilization of end-products absorbed from tract. Abnormal rumen function.
618 Advanced Nutrition — Minerals and Vitamins (3-0) Cr 3 Alt F Prereq Role of vitamins and minerals in mammalian intermediary metabolism. Integration of cellular biochemistry and physiology of vitamins and minerals
619 Advanced Nutrition — Protein (2-0) Cr 2 S Prereq B 405 Digestion, absorption and intermediary metabolism of amino acids and protein. Integration of cellular biochemistry and physiology of mammalian protein metabolism
620 Advanced Nutrition — Energy (2-0) Cr 2 S Prereq B 405 Digestion, absorption and energy needs of animals as related to cellular biochemistry and physiology. Interpretations of classical and current research
633 Seminar in Animal Reproduction (1-0) Cr 1 F Prereq Permission of instructor. Discussion of current literature and preparation of reports on selected topics concerning physiology of reproduction
653 Applied Poultry and Swine Breeding (2-0) Cr 2 Alt S, offered 1982 Prereq 651. Industrial application of breeding systems, selection methods, inbreeding, and hybridization
654 Applied Beef and Dairy Cattle Breeding (2-6) Cr 2 Alt S, offered 1982 Prereq 651. Industrial application of breeding systems, sire selection and evaluation, and crossbreeding
670 Molecular Biology of Muscle (B 670) (3-0) Cr 3 Alt F, offered 1982. B 405, 402, or 404 Microstructure and chemical composition of muscle tissue. Chemistry, function, and turnover of muscle and connective tissue protein. Molecular aspects of muscle contraction
680 Modern Views of Nutrition (F N 680) (2-0) Cr R S Current concepts in nutrition and related fields. Required for all graduate students in nutrition
684 Seminar in Meat Science (1-0) Cr 1 S Prereq Permission of instructor. Discussion and evaluation of current topics in research publications in meat science
685 Seminar in Muscle Biology (1-0) Cr 1 S Prereq Permission of instructor. Reports and discussion of recent literature and current investigations

Anthropology

Administered by the Department of Sociology and Anthropology

Dennis M. Warren, Coordinator

Professors: Gradwohl, Warren, Whitleford

Associate Professors: Bower, Schuster

Assistant Professor: Huang

Undergraduate Study

Anthropology majors may choose either a Bachelor of Arts or a Bachelor of Science degree. A Bachelor of Arts degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Groups I, II, and/or IV. A Bachelor of Science degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Group III.

Undergraduate students with majors in anthropology usually include the following courses in their program. 111, 218, 219, 220, and 221. Only one of a foreign language is required. Excellent supporting courses directly related to anthropology will be found in sociology, psychology, zoology, genetics, history, political science, philosophy, earth sciences, and economics. Undergraduates majoring in anthropology may elect these areas or others as minors. Anthropology majors may elect a second major in some studies. Undergraduates majoring in sociology and majors outside the department may minor in anthropology.

The principal subdisciplines of anthropology are represented by the following:

1. General cultural anthropology and ethnology: 111, 218, 310, 311, 312, 321, 322, 323, 324, 327, 332, 333, 335, 340, 350, 490B

2. Archaeology 220, 320, 334, 420, 426, 428, 429, 490A

3. Linguistic anthropology: 221, 490D

4. Physical anthropology: 219, 490C

Graduate Study

The Department of Sociology and Anthropology offers the degree Master of Arts in Anthropology. Graduate courses are given in the areas of biological, archaeological, sociocultural, anthropological, linguistic, anthropology, history, and theory, and methodology. Competence in one foreign language and in statistics to be demonstrated. A thesis, generally based on original fieldwork, is required.

Courses open to graduate students for minor credit only: 420, 426, 428, 429

Courses Primarily for Undergraduate Students

111. Introduction to Anthropology. (3-0) Cr 3 F SS Introduction to the comparative study of human kind through time and cross-culturally. Survey of the concepts, methods, and approaches to anthropology within the framework of its major subdivisions: the biological (physical anthropology, including human origins and primate studies) and the cultural (socio-cultural anthropology, including archaeology and linguistics).

218. Cultural Anthropology. (2-2) Cr 3 S SS Prereq. 111 Study of humanity in sociocultural perspective. Anthropological concepts and techniques in interpreting world cultural similarities and differences. Institutional and individual aspects of culture, including family and kinship, economic, political and belief systems in developmental and cross-cultural perspectives.

Participatory lab with focus on anthropological fieldwork techniques.

219. Physical Anthropology. (2-2) Cr 3 S Prereq. 111 Human evolution as known from fossil evidence, comparative primate studies, and genetic variations in living populations. Laboratory-tutorial sessions include study and discussion of human osteology, fossil hominids, simple Mendelian traits, and bio-ethics in applied physical anthropology.

220. Archaeology. (4-2) Cr 4. Prereq. 111. Nature of archaeological evidence, its recovery and use in reconstructing human behavior and environments of the past. Field trip provides participatory experience in data collection and analysis. Laboratory-tutorial sessions include study and discussion of classification systems, stone tool manufacture, ceramic technology, and ethics in public archaeology.

221. Linguistic Anthropology. (2-2) Cr 3 F Prereq. 111 Nature and development of human language capabilities, biological basis of human language acquisition, language learning among non-human primates, language and thought, language and culture, aspects of cultural systems. Cross-cultural study of language and communication, structural and transformational linguistics. Participatory lab; focus on linguistic analysis as a tool for anthropological fieldwork.

310. Psychological Anthropology. (3-0) Cr 3 Alt. S., offered 1983. Prereq: 218. Relationship of cultural, social, and personality factors in human behavior with emphasis on cross-cultural comparisons; history of the field. Theories of child rearing and personality development; relationship between social structure and personality, between mental health and culture. Application of anthropological research methods to the study of socialization, deviance, ethno-psychiatry, and culture change.
The Master of Architecture degree program follows the degree Bachelor of Architecture shall include:

- 2 Arch 501
- 10 Thesis or terminal studio* (Electives)
- 30 Total credits

The Master of Architecture degree program following the degree B.A. or B.S in architecture or environmental design shall include:

- 2 Arch 501
- 10 Arch 605, 606
- 3 History, theory and criticism options**
- 6 Building sciences options***
- 10 Thesis or terminal studio*
- 12 Concentration****
- 17 Electives****
- 60 Total credits

All graduate programs require the guidance of a graduate program of study committee.

An optional one-semester foreign study program may be offered depending on available resources in the department.

Graduate Study

The department offers several graduate programs leading to the professional degree Master of Architecture with major in architecture Minor work is offered to students taking major work in other departments.

The programs leading to the Master of Architecture degree are designed to educate professional architects to work effectively within contemporary constraints, to comprehend continuing changes within our society, and to formulate concepts for a better human environment.

The programs of study:

Program 1. A 30-graduate-credit program for those holding the degree Bachelor of Architecture

Program 2. A 60-credit program for those holding the degrees B.A. or B.S in architecture or environmental design

Program 3. A program of more than 60 credits tailored to the experience, training, and education of students with other baccalaureate degrees

Programs 2 and 3, a minimum of 40 credits must be graduate credits.

It is possible to arrange a program of study for the Master of Architecture degree on a non-thesis basis

Admission to the graduate programs will be based on the qualifications of the applicants and on available resources in the department.

The undergraduate curriculum in the Bachelor of Arts in Architecture program provides the academic introduction to the field of architecture and to the peripheral field of environmental design. While the Bachelor of Arts in Architecture degree is not a professional degree, it is intended to assist students in ultimately pursuing any one of several alternative careers by acquainting them to follow their particular interests and aptitudes, both in depth and in breadth, and to explore many potentially valuable roles related to the building environment.

The degree Bachelor of Arts in Architecture is awarded upon successful completion of the 127 5 credit program.

The Bachelor of Arts in Architecture degree prepares the student for further studies leading to the first professional degree, either the Bachelor of Architecture or the Master of Architecture. Qualified students seeking registration as an architect are advised to undertake one of these professional degree programs.

Students are encouraged to seek practical experience in professional settings during summer vacations and/or prior to undertaking graduate studies. Admission to the Bachelor of Architecture program will be based upon the qualifications of the applicants and upon available resources in the department.

A fee will be assessed when field trips are indicated. Other course, laboratory, and/or studio fees may also be required.

An optional one-semester foreign study program may be offered depending on available resources in the department.

Courses Primarily for Undergraduate Students


204. Three-Dimensional Studio. (Art 204) (0-6) Cr 2 each time taken. F S Investigation of basic sculptural media, modeling in clay, wood carving, stone carving, casting in plaster and metal, welding, and other constructing techniques. No more than 8 credits may be applied toward a degree in architecture for the sum of credits earned in 204 and 303.

211. Computer Applications. (2-2) Cr 3 S Survey of computer applications in architecture and environmental design. Current and potential applications of digital computers in architecture and interior design. Use of design and multimedia software related to applications. Field trip Fee.

235. Drawing I. (0-6) Cr 2 F S Prereq. Dsn S 140. Freehand drawing as a design tool conceptualization, development, refinement, and presentation. Introduction to basic objective drawing techniques. Scale, depth clues, space division, with emphasis on linear perspective as applied to architecture. Fee.

236. Drawing II. (Art 236) (0-6) Cr 2 F S Prereq. 235 or Art 235 Freehand drawing as a design tool conceptualization, development, refinement, and presentation. Includes the human figure in relation to architectural space, and scale. Fee.


312. History of Western Architecture. (3-0) Cr 3 F S. Introductory survey of architecture from ancient to modern times. Relationship to the culture, the visual arts, the site, and the surroundings.

332. Two-Dimensional Studio. (Art 332) (0-6) Cr 2 each time taken. F S Investigations in visual design through the medium of studio painting. Emphasis on materials, techniques, and color/shape relationships with consideration for their expressive, decorative, and structural potentials. No more than 8 credits may be applied toward a degree in architecture for the sum of credits earned in 332 and 532.


372. Architectural Programming. (3-0) Cr 3 F Prereq. 325. Programming space needs through problem analysis as a prelude to the design process.

373. Methods of Inquiry in Architectural Design. (3-0) Cr 3 F S Prereq. 305. Overview of methods of inquiry from common sense to rigorous scientific procedures related to architectural design processes.


430. Drawing III. (0-6) Cr 2 each time taken. F S Prereq. 335. Advanced freehand drawing as an architectural design tool. Studio problems including human figure, natural environment, built form, space-scale relationships, perspective, and rendering techniques. Fee.

431. Advanced Architectural Graphics I. (0-6) Cr 2 F S Prereq. 235. F S 436. Application of principles of graphic renderings, such as tonalities interactions, scale, interpretation, environmental illusionary symbols (trees, people, objects), spatial illusion, applied perspective relationships, and perceptual implications of natural visual phenomena to graphic illusion techniques. Simple limited graphic media.

432. Advanced Architectural Graphics II. (0-9) Cr 3 F S Prereq. 431. Exploration of a variety of visual graphic rendering media in applications of the principles of Arch 431 and explorations of combinations of visual presentation media.

434. Introduction to Computer-Aided Architectural and Environmental Design. (3-0) Cr 3 F Prereq. 211, a design course, permission of instructor. Application of the computer as a design tool, and computer graphic methods. Development of computer software for architectural and environmental problem solving. Field trip. Fee.


466. Multi-Family Housing. (3-0) Cr 3 F S Prereq. Senior classification. Historical survey of private and publicly provided multi-family housing types, including urban and future projects for housing. Field trip Fee.
Courses Primarily for Graduate Students, major or minor, open to qualified undergraduate students.

501 Seminar, (2-0) Cr. 2 F.S. Professional philosophy of architecture. Investigation of traditional and new roles in architectural practice.

502 Seminar, (1-0 to 3-0) Cr. 1 to 3 each time taken F.S. Investigation of the changing relationships between professional practice and the needs of society.

507 Urban Housing Studio, (0-18) Cr. 6 F.S. Prereq. Admission to the B.Arch or graduate program. Design of moderate to high density housing in urban environments.

509 Urban Design Studio, (0-18) Cr. 6 F.S. Prereq. Admission to the B.Arch or graduate program. Urban design processes applied to contemporary urban settings.

509 Environment-Behavior Studio, (0-18) Cr. 6 F.S. Prereq. Admission to the B.Arch or graduate program. Solving physical environmental problems through the analysis of human behavior.


512 Architectural Thermal Environment, (3-0) Cr. 3 F.S. Prereq. Biological, and artificial lighting. Visual stimuli, comfort, discomfort, and the effects of light on human systems of control. Field trip Fee.


515 Protection in Building Fire Safety, (3-0) Cr. 3 F.S. Prereq. Biological, and artificial lighting. Visual stimuli, comfort, discomfort, and the effects of light on human systems of control. Field trip Fee.

516 Construction Methods, (3-0) Cr. 3 F.S. Prereq. Biological, and artificial lighting. Visual stimuli, comfort, discomfort, and the effects of light on human systems of control. Field trip Fee.


521 Topical Studies in History, Theory, and Criticism of Architecture, (3-0) Cr. 3 each time taken F.S. Prereq. Permission of instructor. Field trips Fee.

522 Advanced Two-Dimensional Studio, (3-0) Cr. 2 each time taken F.S. Prereq. 332. Advanced studies in visual design. Emphasis on materials, techniques, scale, and color/shape relationships. Potential for expressive, decorative, and optical effects for independent and architecturally integrated projects. No more than 8 credits may be applied toward a degree in architecture for the sum of credits earned in 332 and 532.

533 Advanced Three-Dimensional Studio, (0-6) Cr. 2 each time taken F.S. Prereq. 204. Advanced study and wideanging sculptural expression with emphasis on individual interest. No more than 8 credits may be applied toward a degree in architecture for the sum of credits earned in 332 and 532.

543 Office Practice, (3-0) Cr. 3 F.S. Prereq. 311, 312, 306 or A/315. Contracts, documents, specifications, working drawings, office procedures, and administration. Field trip Fee.

544 Advanced Topics in Architectural Technologies, (3-0) Cr. 3 each time taken F.S. Prereq. 311, 312. Field trip Fee.

A. Materials
B. Structural Systems
C. Conveying Systems
D. Industrialized Building Systems and Components
E. Alternative Energy Systems
F. Appropriate Technology

556 Case Studies in Architecture, (3-0) Cr. 3 F.S. Prereq. 3 semesters of design. In-depth investigations of specific, real-world problems of architecture or building utilizing the case method approach, which includes interviewing design professionals, clients, and users and analyzing data found in construction documents and reports. Extensive documented final report.

566 Housing the Elderly, Disabled, and Low-Income, (3-0) Cr. 3 F.S. Prereq. Admission to the B.Arch or graduate program. Social, psychological, and economic parameters of residential architecture for independent and institutionalized persons.

572 Advanced Architectural Programming, (3-0) Cr. 3 F.S. Prereq. 372. Emphasis on design of space, site, and cost factors for design. Procedures, methods, and techniques.

573 Post-Occupancy Evaluation, (3-0) Cr. 3 F.S. Prereq. Admission to the B.Arch or graduate program. Methods of evaluating the physical, social, and psychological performance of buildings following construction and occupancy, with emphasis on behavioral response to the environment and its role in the design process.

574 Real Estate Investment Aspects of Architecture, (3-0) Cr. 3 F.S. Prereq. 405 or 406. Principles of real estate investment and an analysis of their influence on architectural design.

576 Research Methods for Environmental Designers, (3-0) Cr. 3 F.S. Prereq. Admission to the B.Arch or graduate program. Examination of qualitative and quantitative methods of inquiry with specific application to environmental design.

577 Social Impact of the Physical Environment, (3-1) Cr. 4 F.S. Prereq. Admission to the B.Arch or graduate program. Interdisciplinary review and analysis of social scientific research applied to architectural design.

585 Contemporary Urban Design Theory, (3-0) Cr. 3 F.S. Prereq. Admission to the B.Arch or graduate program. Current urban design theory and its application to urban problems.

590 Special Topics, (1 to 5 each time taken, F.S. SS. Prereq. Witten approval of instructor and department head. Projects of special interest to the student.

592, 593, 594 Studio, (3-0) Cr. 3 each time taken F.S. Prereq. 592. Graduate Seminar. Field trips Fee.

Courses for Graduate Students, major or minor

605, 606 Architectural Design, (3-0) Cr. 5 each 605, 606, 607. Prereq. Admission to graduate program. Architectural design problems of increased complexity.

607, 608 Advanced Architectural Design, (3-0) Cr. 5 F.S. Prereq. Professional degree in architecture. Architectural design problems of increased complexity.

609, 610 Individual Design Projects, (0-3 to 6) Cr. 3 to 12 each time taken F.S. Prereq. Approval of major professor.

699, 799 Research, Cr Var. F.S. SS.

Architecture, Art and Design

Art and Design

Jon H. Sontag, Chair of Department

Professors: Allen, Danielson, Fenimore, Gottfred, Heggen, Held, Meuxr, Miller, Pickett, Sontag

Emeritus Professors: Adams, Garfield, Petersen, Watson

Associate Professors: Bro, Dake, Evans, Fowles, McLea, Polster, Townsend, Warne, Zimmerman

Assistant Professors: Baer, Benitez, Figura, Fremad, Hromay, McClain, Morgan, Shouse, Shull, Smith, Sreenivasam, Stout, Tilden, Tow Weinken

Instructors: Camp, Hedrick, Molson, Paspa

Undergraduate Study

For undergraduate curricula in art and design leading to the degrees Bachelor of Arts and Bachelor of Fine Arts, see Design, Curriculum

The department offers work for the degree Bachelor of Arts in advertising design, art education, craft design, general art, and interior design and work for the degree Bachelor of Fine Arts in art and design.

I. Advertising Design. This curriculum prepares students for positions in graphic design, for work requiring imagination and skills in the layout and design of communication media that will express concept and purpose with clarity and style.

II. Art and Design. This curriculum is planned for students who desire a strong professional concentration within the Department of Art and Design. Students must make application and be admitted by a department committee. A portfolio review is also required.

III. Art Education. This curriculum is planned for students preparing for certification to teach art in grades kindergarten through twelve. Students may enroll in art education. Students must make application to and be accepted by the teacher education committee in the Department of Art and Design and the University Committee on Teacher Education. The program outlined for art education is under the College of Design, Department of Art and Design. For general requirements for teacher certification, see College of Education

IV. Craft Design. This curriculum provides for a general knowledge of the craft areas and a possible concentration in an area of the student’s choice: clay, metal, structural fiber art, or fabric. The student gains a concentrated background preparing for careers such as marketing crafts, free lance design, or teaching in community education.

V. General Art. This curriculum provides students with a liberal education in the visual arts. A strong general education is provided with the art and design foundations, an art concentration, recommended minor area, and electives. Options for minors may include film, literature, music, theater, period minors, or individual minors designed within departmental guidelines.

VI. Interior Design. This curriculum is planned for art students who plan to enter the professional field of interior design.
Graduate Study

The department offers work for the degree Master of Arts in art and design and minor work to students taking major work in other departments. Within art and design, the graduate student may specialize in advertising design, art education, craft design, and interior design.

A student in the graduate program may select either a thesis or nonthesis option under the department Master of Arts degree program. The thesis option requires a minimum of 30 graduate credit hours and the completion of a thesis. The nonthesis option requires a minimum of 34 credit hours and the development of a research project, or an other option a minimum of 8 credit hours of related coursework. Work required outside the department.

Specific information about the requirements for either of the degree options is available from the departmental office.

The department also cooperates in the interdepartmental minor program of Housing (see index).

Open to graduate students for minor only 433, 450, 469, 471

Courses Primarily for Undergraduate Students

101 Foundations of Design (2-0) Cr 2 F S Understanding the creative design process through an exploration of the art elements, contemporary design, and interdisciplinary relationships to art and design.

102 Basic Design Studio (0-4) Cr 2 F S Two- and three-dimensional design experiences.

170 Calligraphy (1-5) Cr 3 F S S Handwritten letter forms derived from traditional alphabets. Exploration of tools, materials, and composition. Fee

203 Color (1-5) Cr 3 F S Prereq 102 or Des S 140 Experiences in color interaction, color theory, and the underlying principles of five and subtractive color mixture.

204 Three-Dimensional Studio (Arch 204) (0-6) Cr 2 Each time taken F S Investigation of basic sculptural media modeling in clay, wood carving, stone carving casting in plaster and metal, welding, and other construction techniques. No more than a sum of 8 credits may be applied toward a degree in the art and design department.

205 Space, Light, and Shadow (1-5) Cr 3 F S Prereq 102 or Des S 140 Introduction to spatial perception. Natural and artificial light modulation. Fee

212 Introduction to Art Education (2-3) Cr 3 F S S Introduction to the field of art education. Coordinated lecture and studio experience. Fee

213 Practicum: Art Education (0-2) Cr 1 Each time taken maximum of 3 F S Prereq Credit or classification in 212 Field experience in art education programs.

220 Design in Wood (1-5) Cr 3 F S Introduction to the visual and aesthetic qualities of wood. woodworking techniques.

222 Design in Clay (1-5) Cr 3 F S S Introduction to clay construction, decoration, and firing. Fee

227 Jewelry and Decorative Metamorphing (1-5) Cr 3 F S Design of jewelry and metal objects using basic construction techniques. Fee

231 Painting (1-5) Cr 3 F S S Credit or classification in Des S 140 Introduction to water based media. Fee

233 Drawing (1-1) Cr 3 F S S Prereq Des S 140 Emphasis on composition and techniques in relation to visual imagery.

236 Drawing II (Arch 236) (0-6) Cr 2 F S Prereq Arch 226 and Drawing as a design tool. emphasis on drawing as a design tool. conceptualization, development, refinement, and presentation. Includes the human figure in relation to architectural space, and scale. Fee

243 Fiber Preparation and Structural Fabric Design (1-8) Cr 3 F S Use of natural fibers and dyestuffs, spinning and fabric construction using offloom processes. Fee

244 Design in Structural Fibers (1-8) Cr 3 F S F S Fabric design on a four-harness loom.

247 Stitching and Fabric Assemblage (1-5) Cr 3 F S Two and three-dimensional design problems using stitchery techniques. Fee

261 Fundamentals of Interior Design (2-3) Cr 3 F S S Use of design principles, color and materials for creating a living space. Lecture and studio experiences introducing the interior design process. Fee

264 Interior Designation (1-5) Cr 3 F S Prereq 203, credit or classification in 261, F E 125. Principles of hand and mechanical perspective as applied to interior illustration. Various material techniques for presentation of designs.

270 Graphic Lettering and Typographii (1-5) Cr 3 F S Prereq 170, Des S 140 Transition from hand drawn letter forms to typographic introduction to specification, letter design, and designing with type. Fee

278 Fashion Illustration I (TC 278) (1-5) Cr 3 F S Prereq Des S 140 Drawing the fashion figure and apparel from live models. Studies and compositions in a variety of media. Historical and contemporary fashion illustration techniques. Fee

280 History of Art I (3-0) Cr 3 F S Development of the visual arts of western civilization including painting, sculpture, architecture, and crafts from prehistoric through Gotic Art.

281 History of Art II (3-0) Cr 3 F S Development of the visual arts of western civilization including painting, sculpture, architecture, and crafts from the Renaissance to the twentieth century.

285 History of Furniture and Ornament I (3-0) Cr 3 F S Furniture styles, interior architectural backgrounds and ornamental arts of Europe.

286 History of Furniture and Ornament II (3-0) Cr 3 S Furniture styles, interior architectural backgrounds and ornamental arts of America.

300 Sources of Visual Design (1-5) Cr 3 F S Prereq 260 Discussion and studio exercises to develop awareness of external and internal sources for design.

301 Design Workshop (0-4 to 0-10) Cr 2 to 5 Each time taken maximum of 10 F S Prereq Des S 140 Problems in two and three-dimensional design group and individual problems. class critiques. Fee

312 Perceptual Education Methods (2-4) Cr 3 F S Prereq 275, 278 Fashion figure and apparel drawing from live models with an emphasis on color and other visual media. The fashion figure in advertising or fashion design presentation techniques.

320 History of Art I (3-0) Cr 3 F S Prereq 260 Discussion and studio exercises to develop awareness of external and internal sources for design. Fee

332 Two-Dimensional Studio (Arch 332) (0-6) Cr 2 Each time taken F S Study and experience toward a degree in the art and design department.

333 Painting (1-5) Cr 3 F S S Prereq 235 Oil and/or acrylic media. Fee

340 Resist and Dyed Fabric Design (1-5) Cr 3 F S S Prereq 235, 251 and 252 and dye applied to two- and three-dimensional textiles. Fee

347 Printed Fabric Design (1-5) Cr 3 F S S Repeat pattern design using block and screen printing techniques.

350 Life Drawing (1-5) Cr 3 Each time taken maximum of 9 F S Prereq Des S 140 Drawing from the human figure.

358 Printing: Lithography (1-5) Cr 3 Each time taken maximum of 9 F S Prereq 235 The photographic process and printing principles and characteristics of metal plate lithography, studio production Fee

359 Printing: Intaglio: (1-5) Cr 3 Each time taken maximum of 9 F S Prereq 235 Studio exploration of intaglio processes to develop knowledge and production skills with limited edition prints. Fee

363 Interior Materials and Systems (3-0) Cr 3 F S Prereq 261, TC 204 Technical knowledge of interior furnishings, products, and materials construction elements and methods.

364 Residential Interior Design I (1-5) Cr 3 F S Prereq 264, credit or classification in 296 and 306. Design problems for the multi-unit residential environment. Design concept, space planning, furnishing, accessory, and materials selection, color schemes, visual presentation. Fee

367 Commercial Interior Design I (1-5) Cr 3 S S Prereq 264 Design problems include restaurant, retail store, office planning, simulation. Space planning, furniture, accessory, and materials selection, color schemes, and visual presentation. Fee

368 Contemporary Interior Design Concerns (2-2) Cr 3 S S Prereq 264 Contemporary design in furniture and design trends, including interiors, furnishings, and product design. Fee

369 Interior Design Internship Art 6 S S Prereq 363, 364, 367 Professional interior design off-campus experience. And an emphasis in market research, business procedures, and client relationships.

370 Graphic Design I (1-5) Cr 3 F S Prereq 270, F E 125 Body copy, display copy and photo indication for layout. Design of layout for television and print media. Fee

375 Graphic Art Production Methods (1-5) Cr 3 F S Prereq 370 Design and preparation of camera ready art, type specification Field trip Fee

383 Greek and Roman Art (3-0) Cr 3 Alt S offered 1983 Greek art from the Archaic and Hellenistic periods. Roman art from the traditional leading to the end of the empire in the West.

385 Renaissance Art (3-0) Cr 3 Alt S offered 1982 European art including painting, sculpture, architecture, and crafts. thirteenth through sixteenth centuries.

386 Baroque and Rococo Art (3-0) Cr 3 Alt S offered 1982 European art including painting, sculpture, architecture, and crafts. seventeenth and eighteenth centuries.

391 Twentieth Century American Art (3-0) Cr 3 S S American art from 1900 to the present.

392 Twentieth Century European Art (3-0) Cr 3 Alt S offered 1981 Painting, sculpture, architecture, and crafts. of Europe. 1900 to the present.

412 Strategy and Curriculum Design (3-3) Cr 3 F S Prereq 410, 411 Admission to Professional Program through art education. Organizing art experiences for the classroom. Field experience. Taught in 4-week session preceding student teaching experience. Fee

417, 418 Supervised Teaching of Art (12 weeks) Cr 6 Each F S Prereq Art 369, 370 Art education in the art education curriculum, advance reservation required. Experience in teaching art 417 in the elementary school, 418 in the secondary school. Taught in conjunction with 415.

420 Design in Wood (1-5) Cr 3 Each time taken, maximum of 9 F S Prereq 220 Frame construction design and techniques Fee

422 Design in Clay (1-5) Cr 3 Each time taken, maximum of 9 F S Prereq 222 Design and construction techniques for case goods. Fee

427 Jewelry and Decorative Metamorphing (1-5) Cr 3 Each time taken, maximum of 6 F S Prereq 227 Design of jewelry and hollow forms combining traditional structure and construction techniques. Fee

430 Allied-Dimensional Studio (Arch 330) (0-6) Cr 2 Each time taken F S Study and experience toward a degree in the art and design department.

433 Painting (1-5) Cr 3 F S S Prereq 235 Oil and/or acrylic media. Fee

440 Design in Structural Fibers (1-8) Cr 3 Each time taken, maximum of 6 F S Prereq 240 Two and three-dimensional weaving.

447 Surface Design—Advanced Fabric Design (1-5) Cr 3 Each time taken, maximum of 6 F S S Prereq 6 credits in surface design. Dyeing, printing, stitching, and mixed media, and two- and three-dimensional weaving. Fee

450 Advanced Drawing (1-5) Cr 3 Each time taken, maximum of 9 F S Prereq 235 Figure and non-figurative drawing with extended work in media, composition, and theory. Fee
Biochemistry and Biophysics

James Allen Olson, Chair of Department

Professors: Applequist, Atherly, Behz, Brenner, French, Fromm, Graves, Hamont, Horowitz, Metzler, Olson, Robson, Stone, Stroemer, B H Thomas, Tipton, Wanier, Young

Associate Professors: D Balinsky, Good, Hauser, Oltka, Rebers, Roy, Royg, A J A White

Assistant Professors: Cox, Jackman

Undergraduate Study

The department offers majors in biochemistry or biophysics for students in the College of Sciences and Humanities and a major in agricultural biochemistry for students in the College of Agriculture.

Biochemists and biophysicists seek to understand life processes in terms of chemical and physical principles. They are employed wherever a better understanding of living organisms is sought, whether in the production of antibiotics or vitamins in a fermentation industry, in investigation of nutritional requirements of plants or animals, or in the study of the functions of the human body in health and disease. There are many opportunities in universities and medical schools, government laboratories, and industry for men and women well trained in biochemistry or biophysics. Students who meet the necessary high scholastic standards usually continue their studies in a graduate college.

Agricultural Biochemistry Major in the College of Agriculture

For the undergraduate curriculum leading to the degree Bachelor of Science, see College of Agriculture, Curriculum. This program of study is recommended to students interested in advanced study or employment in areas of agriculture requiring strong preparation in biochemistry, chemistry, physics, and mathematics, or in preparation for the study of veterinary medicine.

Biochemistry or Biophysics Majors in the College of Sciences and Humanities

For the undergraduate curriculum leading to the degree Bachelor of Science, see Sciences and Humanities, Curriculum. These programs are recommended to students whose career interests might involve advanced study or employment in biochemistry or biophysics, or in related areas of the biological or medical sciences.

Undergraduate sciences and humanities majors in biochemistry usually have the following basic courses or their equivalents in their programs:

B 101, 102, 201, 411, 461, or 551, 501, 502, or 404, 405. Chem 177, 177L, 178, 210, 331, 332, 333A or B, 334A or B, 324, 325, 325L, Math 165, 166, 286, Phys 211, 222, Biol 110, 110L, and a minimum of 10 credits of biological science courses from Biology, Botany, Genetics, Microbiology, and Zoology.

Undergraduate majors in biophysics usually include the following basic courses in their programs:

B 101, 411 or 551, Chem 177, 177L, 178, 210, 321, 321L (or Phys 311), 322, 331, 332, Math 165, 166, 286, 266, and 125 or Com S 172, Phys 221, 222, 324, Biol 110, 110L, Zool 206 or Bot 207, Gen 330, and 6 additional credits in advanced biochemistry, biophysics, biological sciences, chemistry, or physics.

Students wishing a strong preparation for graduate studies are advised to take further mathematics courses such as 385 and 465.

These lists of courses should not be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given solely for the convenience of students or advisers who wish to estimate the amount of basic study that may be needed.

Sciences and humanities majors are required to earn 6 credits in a foreign language, preferably French, German, or Russian.

For courses in agricultural biochemistry, see biochemistry curriculum under College of Agriculture listing.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with majors in biochemistry, biophysics, and molecular, cellular, and developmental biology, and minor work to students taking major work in other departments.

The department also participates in the interdepartmental programs in Immunology, and Molecular, Cellular, and Developmental Biology. (See index.)

Prerequisite to graduate work is completion of sufficient undergraduate work in chemistry, mathematics, physics, and biology.

All graduate students are required by the department to teach as part of their training for an advanced degree.

Candidates for the degree doctor of philosophy must demonstrate a reading knowledge of one foreign language, preferably French, German, or Russian, either by passing (50th percentile or better) the Educational Testing Service examination or obtaining a grade of C or better in a one-year college course in a foreign language. A foreign student whose native language is Chinese, French, German, Italian, Japanese, Russian, or Spanish may be excused from the foreign language requirement.

Open to graduate students for minor credit only 404, 459, 461, 462, 461, 461.

Courses Primarily for Undergraduates

101. Introduction to Biochemical Activities. (1-0) Cr. 1 F, S. Research activities, career opportunities in biochemistry and biophysics, and an introduction to structure of biochemistry.

102. Introduction to Biochemistry. (1-0) Cr. 1 S. Prereq. 1 semester of chemistry. Fundamentals of biochemistry including biopolymers, biocatalysis, metabolism, and biochemical experiments. For majors and potential majors in biochemistry and biophysics.

201. The Chemistry of Life. (2-0) Cr. 2. S. Prereq. Chem 331. Chemical basis of selected aspects of enzymology, metabolism, and molecular biology. For sophomore majors in biochemistry and biophysics, open to others desiring a sophisticated introduction to biochemistry.

221. Structure and Reactions in Biochemical Processes. (3-0) Cr. 3. F. Prereq. 1 semester of chemistry. Fundamentals necessary for an understanding of biochemical processes. For students in agriculture. Not acceptable for credit toward a major in biochemistry or biophysics.

301. Survey of Biochemistry. (3-0) Cr. 3. F, S. Prereq. Chem 231 or 331. A survey of the chemistry of biological molecules, enzymology, metabolism, biosynthesis, and selected topics. Not accepted for credit toward a major in biochemistry or biophysics major.
411 Biochemistry Laboratory (1-3) Cr. 2 F S S S
Prereq: Credit or classification in 301. Emphasis on salient, characterization, and quantification of biological substances. Not acceptable for credit toward a major or minor in biology.

551 Molecular Biophysics (3-4) Cr. 3 F Prereq: Math 166, permission of instructor. Foia. An examination of physical methods for the study of the molecular structure and organization of biological matters, with emphasis on applications to spectroscopy, hydrodynamic methods, and X-ray diffraction.

574 Microscopy (2-0) Cr. 2 S Pre req: Permission of instructor. Outka Principles, methods, and applications of light and electron microscopy. Inclusions phase contrast, fluorescence, and polarization high resolution electron optics. Specimen preparation and photography.

576 Laboratory in Microscopy (4-0) Cr. 2 S Pre req: Credit or classification in 574. Outka. Practical experience in microscopy. Designed to be taken concurrently with 574.

581 Seminar (1-0) Cr. 1 F Pre req: Permission of instructor. Short talks and discussion by students on assigned topics. For entering graduate students and qualified seniors.


630 Lipids (2-0) Cr. 2 Alt. S. offered 1983. Tipton Pre req: 405 or 502. The metabolism of complex lipids and the role of lipids in the structure and function of biologically important molecules.


645 Biochemistry of Metabolic Regulation. (3-0) Cr. 3 Alt. F. offered 1981. Bierz, Thomas, Pre req: Credit or classification in the area of biochemistry. Advance study in metabolic control and regulation. A concentration in the study of regulation of metabolism by hormones and environmental factors. The second semester will deal extensively with the role of animals in the regulation of metabolism.

650 Biochemical Thermodynamics. (2-0) Cr. 2 Alt. S. offered 1982. Applequist Pre req: 321 or 324. Biochemical mechanisms of energy coupling, reactions, denaturation of macromolecules, cooperativity, and metabolic phenomena studied in the framework of thermodynamics.

652 Protein Chemistry (2-0) Cr. 2 Alt. S. offered 1983. Graber, Robert Pre req: 404 or 501. Chemical reactions and physical changes of proteins as a means of determining their structures and biological functions.


681 Advanced Seminar. (1-0) F S Pre req: Permission of instructor. Student presentations.

682: Developmental Seminar. (1-0) F S Pre req: Permission of instructor. Staff and visitor presentations.

689 Seminar in Molecular, Cellular, and Developmental Biology. (MDCB 688) Select Molecular, Cellular and Developmental Biology.

699 Research. Pre req: Permission of instructor.

*Credit for both 402 and 404, 405 (501, 502), for both 201 and 301, or for both 221 and Chem 231 may not be applied toward graduation.

1. Administered by the College of Agriculture. Courses not marked are administered by the College of Sciences and Humanities.
department. Advanced students are encouraged to enroll in Bio 490 (Independent Study) and 495 (Seminar).

Supporting courses include two semesters of general chemistry, one or two semesters of organic chemistry, two semesters of general physics, and two semesters of applied or theoretical mathematics beyond the level of algebra and trigonometry. (A list of appropriate courses is available in the Biology Office.)

Credits for one year of a foreign language are required, except that the language requirement may be waived for students with two or more years of credit in an equivalent course.

Beyond the required courses listed, the student may choose others that complement the student's interests. See listings of the several life science departments. In addition to courses offered on campus, courses in field and aquatic biology are offered at the Iowa Lakeside Laboratory. Courses in marine biology are available at the Gulf Coast Research Laboratory in Mississippi. See departmental offices for descriptions of these courses.

Biology majors seeking certification to teach biology in secondary schools must meet requirements of the College of Education as well as those of the biology program. In addition they must apply formally for admission to the teacher education program. See Index, Teacher Certification.

Advisors in the biology program are faculty members from the participating departments.

Graduate Study

Persons interested in graduate study in biology may take the Master of Science or Doctor of Philosophy degree with a major in any of the life science disciplines. Interdepartmental graduate programs in Molecular, Cellular and Developmental Biology (MCD8), General Graduate Studies, Immunobiology, Biomedical Engineering, and Water Resources are also available.

The master's degree in General Graduate Studies (Biological Sciences) has been established particularly for teachers who wish to broaden and update their formal training in biology.

Courses Primarily for Undergraduate Students

100. Opportunities in Biology (2-0) Cr. R. First 5 weeks. Introduction to the scope of biological science, areas of study, and professional opportunities. Required of first year biology majors

109. Introductory Biology. (3-0) Cr. 3. F S. SS. Life considered at cellular, organism and population levels. Function and diversity of the living world. Basic biological principles and their relevance to modern civilization. Non-majors only

110. Principles of Biology. (3-0) Cr. 3. F S. Prereq. Credit or classification in 110L and Chem 163 or 177 recommended. Organization, metabolism and reproduction of living systems at the molecular, cellular and population levels, growth, development, reproduction, inheritance and natural selection. Evolution, ecology, ecosystems. Non-majors only. Offered on a credit/no credit basis.

110L Laboratory in General Biology. (3-0) Cr. 1. F S. Prereq. Credit or classification in 110; concurrent or previous course required.


312. Ecology. (A Ec 312) (2-0) Cr. 3. F S. Prereq. Bot 207 or Zoology 206. Fundamental concepts and principles of ecology dealing with ecosystems, communities and populations. Field trips include studying habitats and environmental problems.

Advanced Study. Cr. 1-6 each time taken. Prereq. Permission of instructor. See also 490 offerings in biological sciences departments.

495. Undergraduate seminar. Cr. 1 each time taken. Prereq. 15 cr. in biological science.

Courses Primarily for Graduate Students for minor credit, open to qualified undergraduates

500. History of Biology. (3-0) Cr. 3. S S. Prereq. 12 credits in biological science. History majors 6 credits in biological science. Biological discovery and its relationship to the cultural setting, influence of biology on social change.

501. History of Biology. (3-0) Cr. 3. S S. Prereq. 12 credits in biological science. History majors 6 credits in biological science. Biological discovery and its relationship to the cultural setting, influence of biology on social change.

Biomedical Engineering

(Interdepartmental Program)

Neal R. Cholvin, Professor in Charge

Professors: Brockman, R. Canthers, Cholvin, Engen, R. Greer, Rogge, Seagrave, Swift, Young

Associate Professors: Carlson, M. H. Greer

The Biomedical Engineering (BME) Program is an interdisciplinary program in scope and is sponsored jointly by the colleges of Engineering and Veterinary Medicine. Biomedical engineers are concerned with the application of engineering concepts and analytical techniques to problems of biological and medical systems. They are interested in developing new concepts and instrumentation for measurements of living systems. In addition, they seek to understand those phenomena of living systems which have functional capabilities desirable in the design of physical systems. Following completion of biomedical engineering training, they engage in research careers in the various fields of biomechanics and engineering, and in the environmental sciences. They may work on multidisciplinary teams in industrial, governmental, or academic research institutes, or with individuals with the training who can correlate and adapt engineering principles to the problems of medicine and biology, by utilizing engineering knowledge to increase understanding of the functions of biological systems, and by developing new quantitative methods for scientific investigation, and for diagnosis and therapy.

Undergraduate Study

A curriculum leading to a bachelor's degree in biomedical engineering is not offered. Undergraduate students planning graduate study are encouraged to develop knowledge in subjects prerequisite to biomedical engineering courses. For example, undergraduate students majoring in engineering, physics, or mathematics may seek to elect courses in organic chemistry, biochemistry, and biology. Undergraduate students majoring in life science areas should prepare for graduate study by electing courses in mathematics, engineering, and physics.

Graduate Study

Work is offered for the degrees Master of Science and Doctor of Philosophy with major in biomedical engineering, and minor work for students taking major work in other areas. Prereq. Major or minor work in the interdepartmental program of biomedical engineering is an undergraduate degree in one of the fields of engineering, life sciences, physical sciences, or a professional degree in one of the fields of medicine.

Depending upon the individual's background, the BME major will usually elect minor work in one of the following curricula: Biochemistry and biophysics, chemical engineering, computer science, electrical engineering, engineering mechanics, mathematics, mechanical engineering, and veterinary anatomy, veterinary clinical sciences, veterinary pathology, veterinary physiology, or zoology. All students are encouraged to obtain previous background knowledge of organic chemistry, calculus, beginning differential equations, and physics.

The program of formal courses taken by students is oriented toward developing proficiency in research in the interdisciplinary field or in utilizing biomedical principles in clinical situations. Selected background and advanced courses from related disciplines are taken in conjunction with appropriate biomedical engineering courses.

The program of formal courses varies, depending upon the background and interests of the student, and is determined in consultation with the student's committee.

Courses Primarily for Undergraduate Students

401. Introduction to Biomedical Engineering. (3-0) Cr. 3. S. Prereq. Junior classification. An introduction to biomedical engineering principles. Acceptable for major or minor credit.

520. Biomechanics. (E M 520) (3-0) Cr. 3. S. Prereq. Phys 111 or 221, Math 265. For students interested in the life sciences who wish to obtain background in applied mechanics, fluid mechanics, a comprehensive understanding of biomedical applications of basic electronics, measurement techniques, transducers, transport phenomena, mechanics, and computer simulation. Not acceptable for major or minor credit in biomedical engineering.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500. Biomechanics. (E M 520) (3-0) Cr. 3. S. Prereq. Phys 111 or 221, Math 265. For students interested in the life sciences who wish to obtain background in applied mechanics, fluid mechanics, and computer simulation. Not acceptable for major or minor credit in biomedical engineering.

520. Biomechanics. (3-0) Cr. 3. S. Prereq. Math 178 or 266, Phys 222. The principles of thermodynamics and transport phenomena applied to the study of physics and the design and operation of artificial organs and life support systems.

552. Advanced Vertebrate Physiology. (V P P 552) (3-0) Cr. 3. S. Prereq. Phys 111 or 221, Math 265. For students interested in the life sciences who wish to obtain background in applied mechanics, fluid mechanics, and computer simulation. Not acceptable for major or minor credit in biomedical engineering.
Botany

Ronald C. Coolbaugh, Chair of Department

Professors: Anderson, Coolbaugh, Dodd, Donlon, Isely, Knauth, LaMotte, Lersten, Nevins, Pohl, Smith, Stewart, Swenson, Tiffany

Associate Professors: Davis, Farrar, Glenn-Laun, Oulka, van der Valk

Assistant Professors: Chapman, Pearlmutter

Undergraduate Study

For undergraduate curriculum in sciences and humanities, major in botany, leading to the degree Bachelor of Science, see Science and Humanities, Curriculum.  The department offers broad study opportunity in many basic and applied aspects of plant biology. Undergraduate programs are adapted to students of varied interests, preparing them for a wide range of science-related occupations, including biology teaching, conservation and outdoor recreation activities, and research, development, and sales programs of industry and agriculture. The major offers excellent preparation for graduate study in botany, or in related disciplines such as agronomy, biology, forestry, horticulture, pest management, plant pathology, seed science, weed science, and water resources.

Undergraduate programs usually include:

- B 301, Bot 110, 110L, 303, 312, Bot 207, 206, 320, 399, 404, 405, 446, 444, 484, Gen 330, Micro 300, 300L, PP SW 407, Zool 206, 206L, and a year of chemistry. Qualified students are encouraged to enroll in their program through an independent study or research project (Bot 490) under the guidance of a faculty member.

Supporting work in mathematical sciences and physics is strongly advised. Courses at the Iowa Lakeside Laboratory, the Gulf Coast Research Laboratory, or other field laboratories are recommended.

The courses listed above are not fixed requirements, but are intended as a guide to students and their advisers in planning a program best fitted to individual needs.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with a major in botany, and minor work for students majoring in other departments. Within the botany major one of the following areas of specialization may be designated: Aquatic Plant Biology, Relations and ecology of fungi, botany, morphology, mycology, physiology, or taxonomy.

The department also participates in the Interdepartmental programs of Water Resources, and Molecular, Cellular, and Developmental Biology (See Index).

Prospective graduate students need a sound background in the physical, biological, and mathematical sciences, in English, and a reading proficiency in at least one foreign language. The department requires submission of Graduate Record Examination aptitude test scores. For the Ph.D. degree, reading proficiency in one foreign language is required. This may be demonstrated by two years of course work, an ESL language examination, or a departmentally administered examination.

Open to students for graduate minor credit: 320, 403, 404, 405, 406, 424, 444, 484

Courses Primarily for Undergraduate Students

102. Biology of Plants. (2-0) Cr. 2 F 5 SS 8 weeks. Function, structure, development, and evolution of plants. Primarily for students who do not plan to take Bot 207.

202. Field Botany. (2-4) Cr. 2 F 5 SS 8 weeks. Field methods and laboratory in various local habitats. Includes trees, shrubs, flowering plants and other green plants, lichens and fungi. Not recommended for students with professional interest in plant science.

207. General Botany. (2-3) Cr. 3 F 5 SS 8 weeks. Function, structure, development, and evolution of plants. Primarily for students who do not plan to take Bot 207. Course is intended for students who wish to take a course in botany, but who do not plan to major in botany.

256. Dendrology. (For 256) (1-0) Cr. 3 F 5 SS 8 weeks. Family structure, development, and evolution of plants. Primarily for students who wish to take a course in botany, but who do not plan to major in botany.

304. Plants and Civilization. (2-0) Cr. 3 F 5 SS 8 weeks. Function, structure, development, and evolution of plants. Primarily for students who wish to take a course in botany, but who do not plan to major in botany.

305. Plant Taxonomy. (2-0) Cr. 3 F 5 SS 8 weeks. Function, structure, development, and evolution of plants. Primarily for students who wish to take a course in botany, but who do not plan to major in botany.

399. Research. (1-0) Cr. 3 F 5 SS 8 weeks. Function, structure, development, and evolution of plants. Primarily for students who wish to take a course in botany, but who do not plan to major in botany.


517. Physiological Methods and Techniques, (0-10) Cr 2 Alt. F., offered 1982 6 weeks. Preq: Credit or classification in 511 or 512 or 513. Review: Research methods for plant physiological studies.

529. Fine Structure of Plant Cells, (3-0) Cr 3 Alt. S, offered 1983 Preq 310 or 320. 404: Structure and function of organelles, tissues, cells, and cellular components at various levels of evolutionary development.

544. Laboratory in Cytology, (0-3) Cr 1 F Preq: A course in cell biology or classification in 444. Optional laboratory to accompany 444. Light microscopic study of the nucleus and chromosomes.


552. Plant Phylogeny, (1-3) Cr 2 Alt. SS, offered 1982 Preq: 10 credits in biological sciences. Farrar: Morphology, taxonomy, and ecology of the lower vascular plants. with emphasis on ferns


568 Paleobotany, (2-4) Cr 2 Alt. F. offered 1982 8 weeks. Preq: Offered 10 credits in biological sciences. Farrar: Introduction to morphology, identification, and cytology of fossil plants from Pre-Cambrian to present.

590. Plant Communities and Ecosystems, (3-0) Cr 3 Alt. S Preq: 424 or 484 Historical survey of approaches to the study of plant communities and ecosystems.


599. Special Topics, Cr 1 to 3 each time taken Preq: 10 credits in botany, permission of instructor. A. Morphology B. Physiology C. Mycology D. Taxonomy E. Plant Ecology F. Economic Botany G. Cytology H. Aquatic Plant Biology K. Aquatic Plant Biology

Courses for Graduate Students, major or minor


641. General Mycology, (2-0) Cr 4 Each preq: Preq: PP SW 407, or 416, or 417. Tiffany: Taxonomy, morphology, and physiology of slime molds and fungi (phlycomycetes, ascomycetes, basidiomycetes, and fungi imperfecti).


684. Plant Ecology Colloquium, (2-0) Cr 2 Each time taken F/S Preq: Permission of instructor. Discussion of ecological literature and research, term paper and oral presentation, different topics chosen by instructor each semester.


689. Seminar Cr 1 Each time taken Meetings of botany staff and students to discuss recent literature and problems under investigation. A. Morphogy and Taxonomy B. Plant Physiology C. For all staff and students in botany D. Molecular, Cellular, and Developmental Biology (MCDB) E. Ecology G. Economic Botany J. Cytology K. Aquatic Plant Biology

699 Research

690. Environmental Microbiology


590. Special Topics. (See preceding section)

699 Research. (See preceding section)

**Written permission of the instructor is required for all courses offered at the Iowa Lakeside Laboratory. For current information concerning courses, registration, and housing, see the annual Iowa Lakeside Laboratory Bulletin. This bulletin is usually available from participating departments after February 15. Numbers beginning with S indicate courses used by the University of Iowa.

**Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi


**Written permission of the coordinator of the Gulf Coast Research Laboratory, 201 Bessie Hall, Iowa State University, Ames, Iowa 50011, is prerequisite to all courses offered at the Gulf Coast Laboratory. Numbers beginning with BO are GCRLL numbers.

School of Business Administration

Charles B. Handy, Director

Professors: Brown, Handy, Hoover, Louderback, Shadel, Zober

Emeritus Professors: Schrampler, Thompson

Associate Professors: Hatch, Allen, Cherry, Elvik, Miller, Stover, Teras, Velanga, Voorhees

Assistant Professors: Chacko, Crum, Curtis, Deliva, Kniker, Lund, Maydew, McElroy, Morrow, Murphy, Powers, Smith, Van Auker, Wong

Undergraduate Study

The School of Business Administration has two major programs. The Bachelor of Business Administration (BBA) degree, with 5 majors. offers a comprehensive in-depth program of study in business to prepare students for professional careers in specialized functions of business and government. Candidates for this degree must satisfy the requirements established by the College of Sciences and Humanities (See Sciences and Humanities Curriculum in Business Administration) and also the requirements for individual majors specified by the School of Business Administration. The Bachelor of Science (BS) degree, with a major in business administration, offers a broad
program of liberal study within the curriculum requirements of the College of Sciences and Humanities to prepare students with a broader and more diversified background for business, government, and graduate studies (e.g., law, professional studies, public administration, and others). Candidates for this degree must satisfy the requirements established by the College of Sciences and Humanities (See Sciences and Humanities Curriculum) and also additional courses specified by the School. Beginning in 1983 students should be aware that there will be a foreign language requirement for the B.S. degree (see Sciences and Humanities Curriculum for basic education requirements). Students majoring in management will include the following courses (in addition to those required by the College of Sciences and Humanities) to meet the general education requirements: 3 credits in philosophy or religious studies, Sp 211, Math 150, 151, Stat 227, 3 credits in computer science, Econ 201, and one of Econ 304, 401, or 404. They will be required to take 27 credits of core business administration courses and 21 other credits (including up to level courses in at least 3 of the following majors: accounting, finance, management, marketing, and transportation/logistics, and an additional 6 credits to be designated by the student and the adviser).

**Graduate Study**

The School of Business Administration participates in an interdisciplinary program of Industrial Administrative Sciences (IAS) This program offers a Master of Science degree in industrial administrative sciences as well as minor work for students in other programs. Undergraduate courses open to graduate students for minor work are Design (1-0) Cr 3 F SS First 4 weeks Explanation and description of design, reviewing transfer credits, planning academic programs, and precertifying.

**Business Administration Courses for Undergraduate Students (BusAd)**

100 Orientation (1-0) Cr R F S First 4 weeks Orientation and introduction to business, and its interaction with the environment.

110 Introduction to Business, (3-0) Cr 3 F SS Introduction to business in a modern society Major functional areas of business Emphasis on the need for consumerism and its impact on business administration students.

200 Introduction to Careers in Business (1-0) Cr R F S 8 weeks Prereq Sophomore classification. Introduction and orientation to business majors and careers and needs for business administration students.

300 Cooperative Education Cr R Required of all cooperative students. Prereq Permission of department chairman. Students must register for this course prior to commencing each work period.

**Accounting Major**

The primary purpose of accounting is to provide relevant information to both internal users (management and students) and external users such as investors, creditors, government, and the general public. Accounting is an integral part of the management of business and public organizations. Accountants, therefore, participate in planning, evaluating, and controlling the activities of the firm. Accounting is needed by external users in order to make investment decisions, grant or withhold credit, and, in the case of government, collect revenue and gather statistical information. In order to provide useful information, accountants collect, analyze, synthesize, and report data in an understandable manner.

The major in accounting is designed to give students a conceptual foundation as well as to provide a wide range of basic skills and analytical tools for use in reporting for both public and private concerns. Students who complete the accounting major are well prepared to accept positions in industry, government, and the public accounting profession. Completion of this program meets the current educational requirements for taking the CPA examination as established by the Iowa Board of Accountancy.

The requirements for the accounting major are met by successful completion of the following courses: Acct 284, 285, 286, 287, 480, 485, 496, and 497, plus one from Acct 481, 486, 488, and 489. In addition, it is highly recommended that an accounting major include Business Law II (Mgt 316).

**Accounting Courses Principally for Undergraduate Students (Acct)**

- **284 Principles of Accounting I (3-0) Cr 3 F SS** Introduction to the basic concepts and procedures of financial accounting. Includes preparation of financial statements, general ledger cycle, business terminology, basic control procedures, and the preparation and evaluation of financial reports, including those of corporations.
- **285 Principles of Accounting II (3-0) Cr 3 F SS** Prereq: 284 The essentials of managerial accounting. Methodology and uses of internal managerial reports in cost determination, cost pricing, and long-range planning.
- **381 Industrial Accounting (2-0) Cr 2 F SS** Theory and practice of general accounting general survey of objectives and procedures of managerial accounting. A terminal course designed for students not planning further study in accounting. This course does not meet prerequisite for 285 or 480.
- **387 Intermediate Accounting II (3-0) Cr 3 F SS** Prereq: 386, 387 A comprehensive study of financial accounting and financial information on the income and retained earnings statements. Statement of changes in financial position, and the balance sheet. Accounting concepts relating to current and long-term assets of the firm.
- **480 Cost Accounting (3-0) Cr 3 F SS** Prereq: 285 Product costing and control as related to job order process and standard cost systems. Introduction to cost-volume-profit relationships, operational budgeting, and responsibility accounting.
- **481 Advanced Cost Accounting (3-0) Cr 3 F SS** Prereq: 480, 487, 488, 496, 497, 498 Integration of product costing and control procedures, including variable costing, cost allocation, and cost distribution, cost centers and profit centers. Transfer pricing, inventory planning, decision-making, and financial planning. Field trips.
- **485 Federal Income Tax (3-0) Cr 3 F SS** Prereq: 381 or 386. Emphasis on fundamentals of income tax related to an individual taxpayer. Taxation planning to maximize possible tax opportunities. Limited exposure to characteristics of estate and gift taxes. Introduction to concepts involved in taxation of corporations and partnerships.
- **486 Advanced Income Tax (3-0) Cr 3 F SS** Prereq: 485 Emphasis placed on specialized topics in individual tax opportunities. Limited exposure to characteristics of estate and gift taxes. Introduction to concepts involved in taxation of corporations and partnerships.
- **487 Federal Income Tax (3-0) Cr 3 F SS** Prereq: 485 Emphasis placed on specialized topics in individual tax opportunities. Limited exposure to characteristics of estate and gift taxes. Introduction to concepts involved in taxation of corporations and partnerships.
- **488 Federal Income Tax (3-0) Cr 3 F SS** Prereq: 485 Emphasis placed on specialized topics in individual tax opportunities. Limited exposure to characteristics of estate and gift taxes. Introduction to concepts involved in taxation of corporations and partnerships.
- **489 Federal Income Tax (3-0) Cr 3 F SS** Prereq: 485 Emphasis placed on specialized topics in individual tax opportunities. Limited exposure to characteristics of estate and gift taxes. Introduction to concepts involved in taxation of corporations and partnerships.

**Finance Courses**

**Finance Courses for Undergraduate Students (Fin)**

350 Business Finance, Cr 3 F SS Prereq: Acct 285, Econ 201, Stat 227. Introduction to financial management with emphasis on corporate financial decision making, financial statement analysis, time value of money, asset management, valuation of the firm, and an introduction to the use of funds.

351 Real Estate Principles, (3-0) Cr 3 F SS Prereq Econ 201 Legal, economic, and social aspects of real estate, including property rights, contracts, mortgage financing, deeds, leases, taxation, brokerage, property management, home ownership. Real estate values and the general principles of real estate valuation.

352 General Insurance, (3-0) Cr 3 F SS Prereq Econ 201 Insurance concepts, types of insurance, and risk and probability fundamentals of insurance contracts with special emphasis on life and health, and some study of non-life insurance.

353 Management of Financial Institutions, (3-0) Cr 3 F SS Prereq Econ 200 and Econ 334 Analysis of operations of financial institutions from management viewpoint. Emphasis on organization, policy formation, asset and liability accounts, control of capital funds.

451 Real Estate Finance, (3-0) Cr 3 S Prereq: 351 Decision making in the financing of real estate using computerized systems.
basic analytic tools including the applications of various compound interest tables. Principal instruments involved in financing real estate, risk and casualty analysis, financing techniques, and major institutional sources of funds.

452. Advanced Business Finance. (3-0) Cr. 3 F S. Prereq. 350. Theory used in a firm's investment and financing decisions. Emphasis on the use of modern portfolio techniques to produce optimal financial decision trees. 453. Principles of Investments. (3-0) Cr. 3 F S. Prereq. 350, Econ 201. Introduction to various investment media and markets from the viewpoint of the individual investor. Emphasis on modern portfolio theory based on capital market theory. 454. Principles of Investments. (3-0) Cr. 3 F S. Prereq. 350, Econ 201. Introduction to various investment media and markets from the viewpoint of the individual investor. Emphasis on modern portfolio theory based on capital market theory. 455. Security Analysis. (3-0) Cr. 3 Alt S., offered 1982 PreReq. 454. Analysis of key variables that affect stock value: Development of investment strategies. Fundamental and technical analyses. Emphasis on modern portfolio theory as a basis for investment evaluation. Term project required.


457. Life Insurance. (3-0) Cr. 3 Alt F., offered 1982 PreReq. 357. In-depth analysis of health, social, and life insurance. Major types of insurance, retirement plans, business uses of life insurance, and estate planning.

459. Finance Seminar. (3-0) Cr. 3 F S. PreReq. 452, 454. Contemporary problems and current research in financial management from current periodicals, problems, and case analysis investigating those areas requiring financial decisions.

450. Independent Study. Cr. 1 to 3 each time taken. PreReq. Senior classification, permission of instructor.

Management Major

Management is a broadly defined discipline and as a result numerous courses of study are incorporated within this major. To assist students in selecting course combinations that will appropriately match student interests with career opportunities, alternative plans of study in management are developed. Students are encouraged to select either a generalized (general management) or one of several specialized study alternatives (behavioral, management science, management information systems, venture management). The former is designed to provide management majors with a broad overview of the management of business organizations, while the latter are offered in order to provide students some area of expertise within this broad discipline.

All students majoring in management are required to successfully complete the following courses. Mgmt 315, 318, 330, 371, and 478 plus 6 courses as determined by the student's selected plan of study. Recommended courses for the General Management plan include: Acct 480, 481, 485, Com S 211, 221, 322, 332, 375, 441, Econ 404, 445, Fin 351, 357, 452, 512, 475, Math 307, Mgmt 316, 372, 373, 374, 414, 415, 470, 471, 479, 490, Mkt 441, 442, 445, 447, Psych 313, 450, Soc 380, 480, 486, Sp 314, 315, Trcog 480, 486. The School of Business Administration should be consulted for information on the specific alternative plans of study.

Management Courses Primarily for Undergraduate Students (Mgmt)

213. Small Business Management. (3-0) Cr. 3 F S. Prereq. Econ 201, senior classification. An advanced course examining the nature of small business and the problems it faces. 315. Business Law I. (3-0) Cr. 3 F S. SSS. Fundamental principles of law as applied to business transactions and business relationships. Our legal system as an agency of social control, good business technique and practice. The court system, administrative agencies, contracts, and agency.

318. Business Law II. (3-0) Cr. 3 F S. Prereq. 315. Continuation of Mgmt 315. Sales under the Uniform Commercial Code, negotiable instruments, secured transactions, property transactions, partnerships, and wills and estates.


371. Individual Behavior in Organizations. (3-0) Cr. 3 F S SSS Prereq. 370. Behavior of employees in work organizations, motivation of individuals to join and perform in organizations and the relationship of employee satisfaction to elements of the work environment. Emphasis on various management strategies for managing employee behavior.

372. Introduction to Management Information Systems. (3-0) Cr. 3 F S SSS Prereq. 370, Com S 112 or 172. Computer-based management information systems and how such an information system supports decision-making at all levels of management. Development, information retrieval control, and evaluation of information system activities. An in-depth examination of the use of the computer in business.

373. Applications in Business Information Processing. (3-0) Cr. 3 F S SSS Prereq. 370. Design and development of business applications in COBOL and its use in developing data processing applications, methods or storage for processing and storage of financial data, generalized software packages, and the information interface with other functional areas of business.


414. International Business Management. (3-0) Cr. 3 F S Prereq. 370, Mkt 340, Fin 350. The nature and economic role of the multinational firm, including the impact of political, legal, and cultural variables upon firm performance and international activity. Case studies illustrate interdependent nature of functional areas of Business professional boundaries.

415. Small Business Investigations. (3-0) Cr. 3 F S Prereq. 478 recommended. An examination and analysis of small business problems. Development of problem-solving and decision-making skills related to small business operations through field study.

416. Legal Environment of Business. (3-0) Cr. 3 F S Prereq. 370, 315. Introduction and analysis of topical legal environment of business. The court system and litigation; contract problems, administrative and legislative processes, regulation, employment practices, legal aspects of management-labor relations, business tort law, and creditor-debtor relationships.

417. Organizational Theory. (3-0) Cr. 3 F S Prereq. 371. A macro view of organizational Emphasis on the organization itself, rather than on people in organizations. Existing theoretical frameworks are employed to help understand why organizations are structured as they are and why they behave as they do.

471. Current Issues in Management. (3-0) Cr. 3 F S Prereq. 371. Current issues concerning employment, employee relations, governmental, union, and societal influences on the nature of current problems, their impact, and alternative coping strategies.

478. Business Policy. (3-0) Cr. 3 F S Prereq. 318, 370, Acct 450, 452, 455. Strategic classification. Strategic concepts and policy issues in modern business, emphasis on the role of executive decision-making as simulated by the case-study method.

479. Management Seminar. (3-0) Cr. 3 S Prereq. Senior classification in management, permission of the instructor. Selection of major topics dealing with the satisfaction of consumer needs in the purchase of goods and services. The primary decision areas in marketing include the definition of problems and decisions dealing with product design, pricing, promotion, personal selling, location of facilities, and distribution. A major in marketing prepares the student for careers in product management, industrial purchasing, advertising and sales promotion, marketing research, personal selling and sales force management, as well as for careers in nonprofit sectors of the economy such as charitable and governmental organizations. Career opportunities are available for students who are skilled in either quantitative or behavioral techniques.

The courses required for a marketing major are: Mkt 340, 442, 443, 444, 447.

In addition to the required courses the student must take three of the following elective courses: Mkt 343, 410, 440, 445, 446, 449. T|

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Marketing Courses Primarily for Undergraduate Students (Mkt)

340. Principles of Marketing. (3-0) Cr. 3 F S SSS Prereq. Econ 201, junior classification, Acct 381 or 284 recommended. Market forces that affect the marketing decision-making process. Management, social, and international aspects of marketing activities.

343. Personal Sales. (3-0) Cr. 3 F S SSS Prereq. Fundamentals of personal sales emphasis on the importance of self-confidence, control in human interactions, and sales techniques, simulations of selling situations.

370. Promotional Strategies. (3-0) Cr. 3 S Prereq. 447. Need for coordination among a variety of promotional elements: advertisement, personal sales, public relations, and sales promotions.


341. Marketing Management. (3-0) Cr. 3 F S SSS Prereq. Introduction to use of marketing techniques in analysis of business decisions dealing with pricing, advertising, personal selling, product development, and channels of distribution.

342. Sales Management. (3-0) Cr. 3 F S SSS Prereq. Functional aspects of sales force management. Procedures for recruiting, selecting, training, and retaining new salesmen, compensation and expense control systems. Problems of sales force motivation and supervision, methods of termination of employment, sales department budgets, distribution-dealer relationships, other selected topics.


444. Marketing Research. (3-0) Cr. 3 F S SSS Prereq. 447. Functional aspects of sales force management. Procedures for recruiting, selecting, and training new salesmen, compensation and expense control systems. Problems of sales force motivation and supervision, methods of termination of employment, sales department budgets, distribution-dealer relationships, other selected topics.

Transportation/Logistics Major

The study of transportation and logistics (physical distribution) serves three purposes:

First, it addresses the importance of the transportation and logistics systems in the social and economic development of the nation.

Second, it serves as a specialized program for those who plan careers in transportation with industry, carriers, and government agencies.

Third, it is a broad educational program which emphasizes the managerial aspects of transportation and logistics systems and concepts rather than the specifics of day to day traffic operations. The requirements for the transportation/logistics major are met by successful completion of the following courses:

Chemical Engineering

Maurice A. Larson, Chair of Department

Professors: Abraham, Arnold, Bautista, Boylan, Burkhard, Burnett, Gill, Hill, Larson, Pulsifer, Reilly, Seagrave, Wheelock

Associate Professors: Collins, Glatz, Jolls, Scharf, Shearer, Sheiler, Uhlbrich

Undergraduate Study

For undergraduate curriculum in chemical engineering leading to the degree Bachelor of Science, see College of Engineering, Curriculum

Chemical engineering is a profession which provides a link between scientific knowledge and manufactured products. The chemical engineer relies on science, experience, creativity, and ingenuity to produce these materials economically. Almost everything of a material nature used by society today has at some point felt the influence of the chemical engineer. From raw materials such as minerals, coal, petroleum, and agricultural products, creative engineers create new forms of fuels, new materials for construction, pharmaceuticals, foodstuffs, synthetic textiles, plastics, solid state electronic components, and so on. The chemical engineer's influence has been felt in the development of nuclear energy, fuel cells, automatic controls, biochemical processes, artificial kidneys and other medical-related devices, as well as in the development of air and water pollution control systems. Many new and exciting challenges await the practicing chemical engineer of the future.

The profession of chemical engineering embraces a wide variety of activities including research, process development, product design, development, manufacturing supervision, technical sales, consulting, and teaching. The engineer can be found in many different locations, ranging from independent research laboratories to large, multidisciplinary industrial corporations.

Successful chemical engineers find careers in government, industry, and industry-related activities. Educational concepts and methods of chemical engineering include the following:

- Chemical engineering
- Physical distribution
- Systems
- Economics
- Management
- Engineering
- Operations
- Logistics

A cooperative education program is available to students in chemical engineering. See Cooperative Programs, College of Engineering

Graduate Study

The department offers work for the degrees Master of Science, Master of Engineering, and Doctor of Philosophy with major in chemical engineering and minor work to students taking major work in other departments.

Requisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that offered in chemical engineering at the institution.

The Master of Engineering degree requires an independent study project. A thesis is required for the Master of Science degree.

Interdepartmental programs between chemical engineering and broader engineering disciplines are provided under the sponsorship of the departments of Engineering and Veterinary Medicine Laboratories. Facilities are available in both biomedical engineering and chemical engineering. See Biomedical Engineering.

The department also participates in the interdepartmental program of Water Resources, and in the interdepartmental minor program of Energy Systems Engineering. (See Index)

Open to graduate students for minor credit only 320, 321, 322, 324, 325, 331, 332, 410, 415, 421, 426, 430, 441, 442, 443, 444

Courses Primarily for Undergraduate Students

105, 202, 202. Seminar (1-0) Cr 4 Prereq. Sophomore classification in chemical engineering. Offered on a satisfactory/fail basis only

120. Material and Energy Balances (4-0) Cr 4 Prereq. Chem 167 Introduction to chemical processes. Physical behavior of gases, liquids, and solids. Application of material and energy balances to chemical engineering equipment and processes.

298, 398, 498. Cooperative Education. Required of all cooperative students. Prereq. Permission of department chairperson. 298 Work periods for students with sophomore standing in a regularly established program 398 Work periods for juniors. 498 Work periods for seniors. Students must register for these courses prior to commencing each work period

301, 302. Seminar (1-0) Cr 4 Prereq. Junior classification in chemical engineering. Offered on a satisfactory/fail basis only


320. Momentum Transport Operations (3-0) Cr 3 Prereq. 210, Cor S 172, Phys 221, credit or classification in Math 267 Momentum and chemical energy balances. Incompressible and compressible fluid flow, Applications to fluid design, piping system design, filtration, packed beds and settling

Mgmt. 510. Business and Social Responsibility (3-0) Cr 3 Prereq. 340. Designed to stimulate critical
Chemical Engineering

Course Descriptions


324. Chemical Engineering Laboratory I. (2-0) Cr. 1 S Prereq. Credit or classification in 320. Experiments covering basic chemical engineering measurements, fuel, air, and water balance, and momentum transfer operations. Computer applications.

325. Chemical Engineering Laboratory II. (2-0) Cr. 1 S Prereq. 324, credit or classification in 321 and 332. Experiments in heat and mass transfer, thermodynamic, hydrodynamic, and chemical reactor performance.


332. Chemical Reactor Design. (3-0) Cr. 3 F S Prereq: 331, credit or classification in 321. Kinetics of chemical reaction, design of homogeneous and heterogeneous chemical reactors.

391. Foreign Study. (1-0) Cr. 1 S Prereq 320, permission of instructor. Preparation for foreign study program. Offered on a satisfactory-fail basis only. Credit for foreign study allowable only upon completion of 392.

392. Foreign Study Program. Cr. 4-6 SS Prereq 391. Study of chemical engineering including laboratories and lectures at University College London. Comparative study of U.S. and English manufacturing. Expenses required. Offered on a satisfactory-fail basis only.

401. 402 Seminar. (1-0) Cr. 1 S Prereq 321, 325. Senior classification in chemical engineering. Offered on a satisfactory-fail basis only.

410. Chemical Process Industries. (3-0) Cr. 3 S Prereq Chem 331. Functioning of the chemical process industries. Raw materials, process routes, intermediates, products, economics, and marketing.


421. Process Control. (2-2) Cr. 3 S Prereq. Credit or classification in 322. Math 267. Control of industrial chemical processes. 2 Cells and applications and limitations. Dynamics of chemical process components and control system design.

426. Chemical Engineering Laboratory III. (3-0) Cr. 1 F Prereq 322, 325. Investigation of chemical engineering process equipment.


441. Modeling and Simulation. (2-0) Cr. 2 S Prereq 322, 332. Simulation of behavior of chemical processes, initial value problems, and other numerical methods. Problems involving fluid flow, distillation, heat transfer, process control, and reactor design.

442. Analog Computer Applications in Chemical Engineering. (1-3) Cr. 2 S Prereq 322. Applications of analog computers to the solution of problems arising in chemical process reactors, process dynamics, and equipment design.

443. Polymers and Polymer Engineering. (3-0) Cr. 3 F Prereq 320, Chem 331. Chemistry of polymers, addition and condensation polymerization, physical and polymer property measurement, production methods. Fabrication and extrusion equipment operation. Applications of polymers in the chemical industry.

444. Applied Instrumentation. (2-4) Cr. 3 F S Prereq. Phys 222. An introduction to measurement primarily for research students. Coordinated lecture and laboratory exercises in basic circuit theory, signal processing, recording and readout devices, and fundamentals of analog and digital instrumentation. Lecture/demonstrations illustrate practical aspects of instrument selection and use.

490. Independent Study. (3-0 to 18) Cr. 1 to 6. Introduction to research methods, investigation of an approved topic. H. Honors.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates


521. Process Dynamics. (3-0) Cr. 3 S Prereq: 421 Application of dynamic analysis techniques in the study of nonsteady state chemical processes.

530. Process Design and Optimization. (2-3) Cr. 3 S Prereq: 430. Advanced process synthesis methods applicable to process design and evaluation.

531. Air Pollution (Mteor 531). See Meteorology.


552. Transport Phenomena and Momentum Transfer. (4-0) Cr. 3 F Prereq: 322, Chem 331, Math 267. Equation of change for mass, energy, and momentum according to phenomenological and molecular models. Introduction to transport in nonideal systems. Exact and approximate solutions to the equations of motion.

553. Heat and Mass Transfer. (4-0) Cr. 4 S Prereq: 552. Convective and radiative heat transfer; boiling, condensation, binary component diffusion, mass transfer models. High-transfer rate effects. Simultaneous heat, mass and momentum transfer.

583. Advanced Thermodynamics. (4-0) Cr. 4 S Prereq: 321. Application of thermodynamic principles to chemical engineering problems. Thermodynamic properties of nonideal fluids and solutions, phase and chemical reaction equilibria.

587. Advanced Chemical Reactor Design. (3-0) Cr. 3 F Prereq: 322. Advanced chemical reactor analysis and design of nonideal flow and heterogeneous reactors.

590. Special Topics. Cr. 2 to 6 each time taken. Investigation of an approved topic on an individual basis.

595. Special Topics. Cr. 2 or 3 each time taken. Prereq. Permission of instructor. When offered with a letter suffix, the following letters are reserved for the topics listed:

- A Multicomponent Distillation
- B Sorption Equilibria
- C Crystallization
- D Thermodynamics
- E Kinetics and catalysis
- F Transport Operations
- G bioengineering

Courses for Graduate Students, major or minor

691. Seminar. (1-0) Cr. 1 S F. Offered on a satisfactory-fail basis only.

694. Advanced Calculation Methods for Chemical Engineers. (2-0) Cr. 3 Prereq: 545. Advanced analysis and design of equipment and processes requiring specialized mathematical techniques. Alt: S. offered 1983.

652. Advanced Momentum Transport. (2-0) Cr. 2 Alt S. offered 1982. Prereq: 552. Advanced topics in momentum transport and fluid mechanics including study of recent literature.


Advanced Topics. Cr var. Research.
Graduate Study
The department offers work for the degrees Master of Science and Doctor of Philosophy with majors in analytical, inorganic, organic, and physical chemistry, as well as the degrees Master of Science and Doctor of Philosophy in chemistry. Co-majors may be taken between areas within chemistry or between one of the areas and another department. Courses in other areas of chemistry as well as courses in other departments may be used to satisfy the requirement for course work outside the major field. Minor work is offered to students taking major work in other departments.

The Department of Chemistry requires all graduate students majoring in chemistry to teach as part of their training for an advanced degree.

Prerequisite to major graduate work is the completion of undergraduate work in chemistry, mathematics, and physics, substantially equivalent to the first two years of undergraduate students at this institution.

For the Ph.D. degree, the foreign language requirement is reading proficiency in one of the following: German, Russian, French, or, in some special cases, Japanese.

Open to graduate students for minor credit:
- 301, 321L, 322, 331, 341L, 426

Introduction to the field of work is given by the second and third digits of course numbers:

(a) Inorganic Chemistry
00-09
(b) Analytical Chemistry
10-19
(c) Physical Chemistry
20-29
(d) Organic Chemistry
30-39
(e) General Chemistry
60-79
(f) Research
99

Courses Primarily for Undergraduate Students

50. Preparation for General Chemistry (2-0) Cr: 0 F S S. Prereq 1 year high school algebra. Basic mathematics and chemistry courses must be taken before they are ready for college chemistry. For students intending to enroll in general chemistry and who have not taken high school chemistry or who have otherwise deficient backgrounds.

160. Chemistry in Modern Society. (3-0) Cr: 3 S Topics of current interest to non-science majors. Non-mathematical survey of selected areas of chemistry with emphasis on the interface between chemistry and other human activities.

163, 164. General Chemistry. (3-0) Cr: 4 F S S. Prereq 1 year high school algebra. Credit or classification in 163L, high school chemistry approved, 164 or 163L. Principles of chemistry and properties of matter explained in terms of modern chemical theory. 163, structure, chemical bonding, energy relations, solution behavior, acid-base and oxidation-reduction reactions, kinetics and equilibrium. Molecular chemistry 164, liquids, solids, change of state, thermodynamics, electrochemistry, descriptive chemistry of metallic and nonmetallic elements, coordination compounds and organometallics.

163L, 164L. Laboratory in General Chemistry. (3-0) Cr: 1 each 163L, 164L. F S S. Prereq 163L, credit or classification in 163, 164, credit or classification in 164L. Laboratory to accompany 163 and 164L must be taken with 163L, 164L, is not a satisfactory prerequisite with 164.

167. General Chemistry for Engineering Students. (4-0) Cr: 4 F S S. Prereq: 50 or high school chemistry. Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer.

167L. Laboratory in General Chemistry for Engineering Students. (3-0) Cr: 1 F S S. Prereq 167. Laboratory in 167.

177, 178, General Chemistry. (4-0) Cr: 4 F S S. Prereq 177. 50 or 1 year high school chemistry and credit or classification in 177L, 178L. Credit for classification in 177L, 178L, or 177, 178L is not a satisfactory prerequisite with 177, 178.

191. Principles of Chemistry I. Prereq 161 or classification in I. A textural course intended for students who do not plan to take additional courses in chemistry. 197L. Laboratory in Principles of Chemistry I. Laboratory to accompany 197.

192. Principles of Chemistry II. Prereq 191. 192L. Laboratory in Principles of Chemistry II. Laboratory to accompany 192.

232A. Physical Chemistry. (3-0) Cr: 3 each 232, 232L. F S S. Prereq 177, 178 or 210 or 211, classification in 233A highly recommended. 332, 332L, classification in 333A highly recommended. Modern organic, inorganic, and physical chemistry.

232B. Physical Chemistry. (3-0) Cr: 3 S S. Prereq 321 or 324. Solids, transport properties, chemical kinetics, quantum mechanics, molecular structure and spectroscopy, statistical thermodynamics. For students majoring in chemistry or biochemistry.

235L. Laboratory in Physical Chemistry. (1-0) Cr: 3 S S. Prereq 322 or 325. S S. Prereq 322 or 325 recommended.

311. 332, Organic Chemistry. (3-0) Cr: 3 each 311, 311L, 332. F S S. Prereq 177, 178 or 210 or 211, classification in 333A highly recommended. 332, 332L, classification in 333A highly recommended. Modern organic, inorganic, and physical chemistry.

399. Undergraduate Research. Cr var Prereq Permission of instructor with whom student proposes to work.

401. Inorganic Chemistry Laboratory. (0-4) Cr: 1 F S S. Prereq 301. Preparation and characterization of inorganic and organometallic compounds by modern techniques. For students majoring in chemistry or biochemistry.


470. Structure and Bonding. (2-0) Cr: 2 F S S. Prereq 325 or 322. Systematic development of orbital concepts for electronic structures in generalized molecular systems. Explanation and prediction of chemical bonding patterns and molecular properties on the basis of such electronic structures. Applications to various classes of inorganic and organometallics.

490. Independent Study. Cr var Prereq Permission of instructor.

499. Senior Research. (0-6 or 0-9) Cr: 2 or 3 each Credit taken Prereq Permission of staff member with whom student proposes to work. Students majoring in chemistry or biochemistry should be selected for this course. Students should consult with their major advisor or a member of the graduate committee prior to registering for this course.

"Credit may not be applied toward graduation for more than one of the following pairs or groups of courses: 160 and any other chemistry course; 163, 164 and any other chemistry course; 177, 178 and any other chemistry course; 331, 332, and any other chemistry course; 333, 334, and any other chemistry course.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates.

500. Advanced Inorganic Chemistry. (2-0) Cr: 2 F S S. Prereq 301. Concepts of structure, bonding, and chemical reactivity applied to inorganic compounds of the metallic and nonmetallic elements. For students not majoring in inorganic chemistry.

501. Inorganic Preparations. (4-0) Cr: 1 F S S. Prereq 301. Preparation and characterization of inorganic and organometallic compounds by modern techniques.

504. Organometallic Chemistry of the Transition Metals. (2-0) Cr: 2 Alt S S. Prereq 301, 332. Transition metal complexes of ligands such as cyanide, phosphines, amines, and carbon monoxide.
chemistry Spectroscopic methods of characterization of inorganic compounds

506. Systematic Inorganic Chemistry (3-0) Cr 3 S Prereq 307 or 500 and 325. Descriptive chemistry of the main groups and their elements.

509. Introduction to Inorganic Chemistry Research. (1-0) Cr F Discussion of the various areas of current research in inorganic chemistry at Iowa State University.

510. Advanced Survey of Analytical Chemistry (2-0) Cr 2 F. Prereq. 316. Selected topics in modern qualitative and quantitative instrumental techniques, titrimetry, spectrometry, and other instrumental methods.

511. Advanced Quantitative Analysis. (3-0) Cr 3 S Prereq. 316. Topics in the analytical chemistry of inorganic and organic analysis. Aqueous and nonaqueous titrations, reagents, sampling and sampling dissolution, and analytical literature.


514. Analytical Separations. (2-0) Cr 2 F Prereq. 316, 325, 325L. Principles and examples of inorganic and organic separation methods applied to analytical chemistry. Solvent extraction, ion exchange, and gas chromatography.

515. Advanced Quantitative Laboratory. (1-6) Cr 3 3 Prereq. 512, 513 and 516. Laboratory methods of qualitative and quantitative chemical analysis.

520. Advanced Physical Chemistry. (2-0) Cr 2 S Prereq. 320, 322 or 325. Topics in the physical chemistry of atoms that they apply to analytical, inorganic, and organic chemistry, including thermodynamics, kinetics, quantum mechanics, and spectroscopy. For students not majoring in physical chemistry.

521. Statistical Thermodynamics. (3-0) Cr 3 F Prereq. 322 or 325. Boltzmann distribution, thermodynamics from a statistical viewpoint, thermodynamic functions of monatomic and polyatomic gaseous molecules, Einstein and Debye crystals.

522. Molecular Structure and Bonding (3-0) Cr 3 S Prereq. 316. Physical chemistry and theoretical studies of photonic phenomena. Molecular orbital theory of physical chemistry that allows them to apply to analytical, inorganic, and organic chemistry, including thermodynamics, kinetics, quantum mechanics, and spectroscopy. For students not majoring in physical chemistry.

523. Chemical Spectroscopy and Structure. (3-0) Cr 3 F Prereq. 505 or 523, 523. Physical chemistry and theoretical studies of photonic phenomena. Molecular orbital theory of physical chemistry that allows them to apply to analytical, inorganic, and organic chemistry, including thermodynamics, kinetics, quantum mechanics, and spectroscopy. For students not majoring in physical chemistry.

524. Chemical Thermodynamics (3-0) Cr 3 S Prereq. 322 or 325. The laws of thermodynamics and their applications to simple and multi-component systems, heterogeneous and homogeneous equilibria, properties of gases, condensed phases, solutions, and surfaces.

525. Diffraction and Crystal Structure. (3-0) Cr 3 At S offered 1982 Prereq. 322 or 325 X-ray techniques, electron microscopy, X-ray diffraction, atomic and molecular Data collection techniques, space group analysis, application of Fourier methods, methods of interpreting X-ray patterns, crystal structure analysis, and methods of interpreting X-ray patterns.

526. Radiochemistry. (3-0) Cr 3 At S. offered 1982 Prereq. 322 or 325. Radiochemistry, preparation and decay properties of radioactive nuclides, interaction of radiation and matter, chemical fixation of radioactivity, application of radioactivity to chemistry, especially to analysis.

527. Surface Chemistry. (3-0) Cr 3 At F. offered 1982 Prereq. 322 or 325. Basic principles and applications of surface chemistry.
Courses Specifically for Undergraduate Students

126 Introduction to Child Development. (2-2) Cr 3
F S S S Emphasis on physical/motor, social/emotional, and intellectual development of children as influenced by family, education, and society. Directed observation of children

201 Family Life Development. (F E) 201 (3-0) Cr 3
F S S S A study of the dynamic processes of development of family and individuals, both normal and exceptional. Patterns of self-development and the span development with focus on the interaction between and among individuals

224 Development and Guidance in Infancy. (3-0) Cr 3
F S Prereq: 129 or 524 or 530 Developmental characteristics of infants from the prenatal period through two years of age. Implications for guidance of infants and topics in family and group care settings. Participation with infants

225 Development and Guidance in Early Childhood. (2-2) Cr 3
F S S S Prereq: 129 or Psych 230 Developmental characteristics of children from 2 to 6 years of age with implications for individual guidance within family and group care settings. Observation and participation with preschool and kindergarten children

226 Development and Guidance in Middle Childhood. (2-2) Cr 3
F S S S Prereq: 129 or Psych 230 Developmental characteristics of children from 5 to 12 years of age with implications for guidance Observation and participation with children

240 Literature for Children. (E Ed 240) (3-0) Cr 3
F S S S Prereq: 129 or Psych 230 Evaluation of literature for children. Roles of literature in the total development of children. Literature selection and use Participation with children

318 Study Tour. Cr 5
F S Prereq: 224 or 225 or 226: minor classification and of visits to and study of child and family centers, institutions, and agencies that serve people in various socio-economic and ethnic groups and the handicapped

341 Activities and Materials for Children. (3-2) Cr 4
F S S S Prereq: 224 or 225: Theories and principles underlying the selection of activities and materials for individual and groups of children, infancy through middle childhood. Participation with children from infancy through middle childhood. Participation with children

342 Guidance of Children: Theories and Practices. (E Ed 342) (2-2) Cr 3
F S S S Prereq: 225, 226: Behaviors of children in group situations. Basic theories of guidance applicable to the marriage counseling field. Principles and techniques for guidance of children Participation with children in groups

385 Young Children with Handicaps. (3-0) Cr 3
F S S S Prereq: 224, 225: Characteristics of children from infancy through 5 years of age with physical, motor, communicative, cognitive, social, emotional, and behavioral exceptionalities. Interactions of impairments and experiences in affecting total development. Effects on family and community

399 Research and Assessment in Child Development. (3-0) Cr 3
F S Prereq: 224 or 225 or 226: Processes of generating a new knowledge through application of the scientific method. Readings in child development methods of research. Considerations for interpreting child development research findings. Review and use of assessment tools in the performance of children including the exceptional child

443 Curriculum Planning for Children. (3-0) Cr 3
F S Prereq: 341 Examination, evaluation, and development of curricula for children. Principles and techniques involved in planning programs for children

445 Administration of Programs for Children. (3-0) Cr 3
F S Prereq: 341 Principles and techniques involved in financial management and programs for children

449 Parent-Professional-Community Relations. (3-0) Cr 3
F S Prereq: 224 or 225 or 226: Interpersonal relationships among child development professionals and parents and other family members, and personnel working toward an optimal environment for children. Strategies for parent involvement including families with exceptional children

417A Supervised Teaching in Prekindergarten-Kindergarten. Cr 6
F S S S Prereq: 443 Classification and full admission to teacher education program. Registration required. Teaching experience with prekindergarten or kindergarten children

417B Supervised Teaching in Child Centers. Cr 6
F S S S Prereq: 443 Classification and full admission required. Teaching experience in a center for children

417C Supervised Teaching in Programs for Handicapped Children. Cr 6
F S S S Prereq: 455 Classification and full admission to teacher education program. Registration required. Teaching experience with preschool handicapped children

418 Practicum Cr 6
F S S S Prereq: 224 or 225 or 226: Supervised work in specialized problems relating to child development

445 Programming for Children with Handicaps. (2-2) Cr 3

490 Independent Study Cr 6
F S S S Prereq: 6 credits in child development Consult department office for procedure

A Child Development
B Nursery Education
C Community Services
F Field experience
H Honors
R Research

Courses Specifically for Graduate Students, major or minor

524 Principles and Theories of Child Development. (3-0) Cr 3

525 History and Theories of Early Childhood Education. (3-0) Cr 3
F S Prereq: 524 or 6 credits in child development or psychology. History and theories of early childhood education. Including intervention models, in the total educational system

541 Fieldwork in Children. (3-0) Cr 3

542 Developmental Disabilities in Children. (3-0) Cr 3
F S Alt.: offered 1982 Prereq: 524 or 6 credits in child development or psychology. Characteristics of children with developmental disabilities: mental retardation, cerebral palsy, epilepsy, autism, and some forms of dyslexia. Consideration of multicultural, family, and educational influences and legal implications. Research on behavioral characteristics associated with developmental disabilities in childhood

545 Planning and Administration of Programs for Children. (3-0) Cr 3
S Alt.: offered 1983 Prereq:
S 325: Objectives, procedures and research relevant to the administration and development of programs for children

548 Parent-Child Relations and Parent Education. (3-0) Cr 3
F S Alt.: offered 1982 Prereq: 524 or 6 credits in child development or psychology. Analysis of theories and research applicable to parent-child interactions. Role of the parent as a socializing agent. Principles, procedures, current models and evaluation of parent education programs

549 Child Rearing Practices Within and Across Cultures. (3-0) Cr 3
S Alt.: offered 1983 Prereq: 524 or 6 credits in anthropology. Analysis of child-rearing practices and life styles of subcultures within the United States and a variety of other cultures. An examination of current research on the child from a cultural perspective

566 Research Methods in Child Development. (3-0) Cr 3
F S Prereq: 543 or 545: Course for Fall 1981 Introduction to concepts, strategies, and methods of developmental research and assessment of children. Application of selected research strategies to current child development research. Experience in assessment procedures, methods of data collection, analysis, interpretation, and dissemination of findings

590 Special Topics. Cr art. 5 credits in child development

616 Seminar. Cr art. F S
A Current Issues in Child Care
B Developmental Processes in Children
C Developmental Appraisal of Children
D Exceptional Children
E Guidance of Children
F Parent-Child Relationships
G Research in Child Development
H Research on excepted persons
I Emphasized Persons in Child Development


651 Cognitive and Language Development in Children. (3-0) Cr 3 Alt. S Alt.: offered 1982 Prereq: 524. Theories of developmental aspects of cognitive and language development: classification in language acquisition; research on syntactic and semantic development. Consideration of issues concerning interrelationships between cognitive development and developmental psycholinguistics

632 Learning and Perceptual Development in Children. (3-0) Cr 3 Alt. F Alt.: offered 1983 Prereq: 524. Analysis of theories and empirical findings in the development of thinking and intelligence. Theories of language acquisition: research in syntactic and semantic development. Consideration of issues concerning interrelationships between cognitive development and developmental psycholinguistics

633 Social and Emotional Development in Children. (3-0) Cr 3 Alt. F Alt.: offered 1981 Prereq: 524. Consideration of theoretical and research contributions to the understanding of children's social and emotional development. Socialization processes and personality development

699 Research.
Civil Engineering

Carl E. Ekberg, Jr., Head of Department

Professors: Austin, Baumann, Brewer, Carstens, Casey, Demrel, Douglas, Ekberg, Handy, Hardy, Hoover, Jellinger, Jayapalan, Klaber, Lee, Lohnes, Marshaw, Mickie, Morgan, Oulman, Patterson, Ring, Sanders, Spangler, Young

Emeritus Professor: Lubsen

Associate Professors: Fung, Girton, Greinheim, Kannel, Porter, Russo, Sheeter, Ward

Assistant Professors: Chase, Dunker, Hastings, Montag, Pitt, Ranch, Ringwald, Rossmillner, Wolde-Tisse

Instructor: Day, Dickerson

Undergraduate Study

For undergraduate curriculum in civil engineering leading to the degree Bachelor of Science, see College of Engineering, Curriculum.

Civil engineering consists of the economic, social, and technological aspects of the art of transforming raw materials into usable forms. Students interested in this field should be aware of the many different forms of employment available in the field. Conditioning may include transportation systems, bridges and buildings, water supply, pollution control, irrigation, and drainage systems, river and harbor improvements, dams and reservoirs. Civil engineering also includes the planning, design, and responsibility execution of surveying operations, and the location, delimitation, and deinition of physical and cultural features on the surface of the earth. Research, testing, sales, management, and related functions are also an integral part of civil engineering. Work on the campus is supplemented by inspection trips which furnish an opportunity for firsthand study of engineering systems in operation, as well as projects under construction.

Graduate Study

The department offers work for the degree Master of Science with majors in civil, geotechnical, municipal, sanitary, structural, and transportation engineering, and in geology and photogrammetry, for the degree Doctor of Philosophy with majors in transportation, structural, sanitary and geotechnical engineering, and minor work to students taking major work in other departments.

Candidates for the degree Master of Science are required to satisfactorily complete 30 credits of acceptable graduate work, including preparation of a thesis or the completion of an engineering report in lieu of a thesis.

The department strongly recommends that all candidates for the degree Doctor of Philosophy demonstrate a significant level of proficiency in one of the following languages: French, German, Russian, or Spanish. However, with the approval of a doctoral candidate's program of study committee, 6 additional credits of course work outside the Department of Civil Engineering may be substituted for a language requirement.

The normal prerequisites to major graduate work is the completion of a curriculum substantially equivalent to that required of engineering students at this University. However, because of the diversity of interests within the graduate programs in civil engineering, a student may qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering. Supporting work will be required depending upon the student's background and area of interest. A prospective graduate student is urged to specify the degree program in which he or she is interested on the application for admission.

The department participates in the undergraduate major program in Energy Systems Engineering and in the interdepartmental programs in Technology and Social Change, Transportation Planning, and Water Resources (See Index).


Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Cr. R. Discussion of various phases of civil engineering. For transfer students only. Evaluation of transfer credits and discussion of graduation requirements.

212 Fundamentals of Surveying. (2-3) Cr. 3 F S Prereq: Math 165 or Math 175. Familiarization with basic instrument and field and office procedures for leveling, transferring, and mapping Survey computations of errors in survey and computer applications. Introduction to photogrammetry and its application to surveying and mapping.

213 Advanced Engineering Surveying. (1-6) Cr. 3 F S Prereq: 212, Comp.1-3: Introduction to precise surveying techniques such as triangulation, adjustment of control points, and coordinate systems. Public land subdivision problems and property surveys. Requirements of highway surveying and earthwork calculations. Introduction to engineering astronomy. Computer applications.


298. 398. 498. Cooperative Education. Required of all cooperative education students. 298. 398. 498. Background for work with students in all areas of engineering practice. 298. 398. 498. Preparation for work for students in sophomore standing in a regularly established program. 298. 398. 498. Preparation for work for students in junior standing in the Civil Engineering major. Students must register for these courses prior to commencing each work period.

301. Cartography. (Geo 301) See Earth Sciences.


328. Sanitary Engineering in Environmental Control. (2-0) Cr. 2 F Prereq: Phys 111 or 221. Review of environmental control, public health through water and wastewater treatment, air pollution control, and solid waste management. Organization, administration, and operation of regulatory agencies. Not available for graduate credit for students in civil engineering.

332. Structural Analysis I. (2-2) Cr. 3 F S Prereq: 332, E M 527. Design and behavior of the elements of steel and iron structures, proportioning members and connections. Introduction to plastic design, composite design, and building and bridge loadings and design.


350. Introduction to Transportation Planning. (3-0) Cr. 3 F S S Preq: 3 credits in statistics, junior classification. Planning of urban and regional transportation systems. Applications of population, land use, economic, social, and travel studies to problems of transportation system configuration and route location. Organization and cost analysis of transportation planning function. Not available for graduate credit for students in civil engineering.


360. Soil Engineering. (2-2) Cr. 4 F S Preq: Geol 301, credit or classification in 3 E M 324. Introduction to basic soil engineering and testing. Identification and classification tests. Soil structure, soil mineralogy, soil water, systems, and interactive forces, aggregate gradation, absorption and blending, principles of settlement, soil bearing values, shearing stresses in soil, and shear strength testing. Application of soil engineering in subgrades, embankments, retaining walls, foundations, piers, and underground conduits.

362. Design of Concrete and Pavements. (0-8) Cr. 4 F S Preq: 332. Analysis of engineering properties of bituminous, Portland cement, and other cements, mix design and testing of concretes, admixtures, mixing, handling, placing and curing, pavement thickness design.

370. Hydrology. (2-0) Cr. 2 S Prep: Phys 111 or 221. Introduction to hydrology and water resources including water sources, distribution, rainfall-runoff relations, streamflow, beneficial uses of water, and water conservation. For non-engineering majors.


412. Survey and Mapping. (2-2) Cr. 2 S Preq. 315. Error theory, adjustment theory, least squares applied to geodetic systems. Survey design principles derived from error propagation theory. Relationship to development of surveying control specifications.

414. General Photogrammetry and Photo-Interpretation. (For 414) See Forestry.


521. Water Pollution Control Plant Design. (2-0) Cr 3 S PreReq. 425, Chem 231, Mech 413, and Civil 441. Evaluation of water and wastewater treatment and control, including analysis, design, and operation of solid and hazardous waste disposal facilities.


531. Structural Analysis by Finite Elements. (3-0) Cr 3 S PreReq. 533 Use of the finite element method for the analysis of complex structural configurations. Plane stress, plane strain, and general purpose finite element programs. Mechanical and electronic calculation, computer programs, and general purpose finite element programs.


533. Classical Analysis Methods. (3-0) Cr 3 F PreReq. 332 Basic structural principles. Moment area, energy methods, and other methods. Extension of slope deflection and moment distribution to non-prismatic members, temperature changes, axial load effects.


540. Behavior of Reinforced Concrete Structures. (3-0) Cr 3 Alt F, offered 1982 PreReq. 334 Behavior and strength of reinforced concrete members by reviews of experimental and analytical investigations, flexural, axial load, shear, bond, torsion, combined loadings.


545. Advanced Structural Design in Metals. (3-0) Cr 3 S PreReq. 333 Design of built-up beams, plate girders and heavy connections. Study of the theories of analysis of built-up members and the interpretation of specifications for the design of bridges and buildings.


552. Advanced Transportation Planning. (3-0) Cr 6 F PreReq. 421. Analysis and design of highway safety criteria, effects of speed, density, traffic control devices, and their impact on the design of highway safety criteria. Development of traffic control devices and their impact on the design of highway safety criteria.

565. Airport Planning and Design. (2-3) Cr 3 S PreReq. 422 Credit or classification in 452. Airports planning including financing, design, construction, operation of landing and terminal areas. Drainage, geometric and structural design of runways, taxiways, and aprons.

570. Transportation Analysis and Forecasting. (2-3) Cr 3 F PreReq. 451. Stat 331 or 401 or 445 Travel studies and analysis of data. Travel projections. Public transportation forecasts and analyses.

575. Urban Transportation Development Laboratory. (1-2) Cr 3 S PreReq. 421. Study of the urban transportation development problem. Includes transportation planning, traffic engineering, and urban development. Forecasting and evaluation of social, economic, and environmental impact of proposed solutions. Considerations of alternatives. Formulation of recommendations and presentation in the host community.

580. Soil Mechanics. (3-0) Cr 3 F PreReq. 360 Advanced treatment of theory and principles of soil mechanics. Soil behavior, permeability, capillarity, seepage forces, stress distribution, effective stresses, consolidation, shear strength, slope stability, earth pressure, bearing capacity, piles, and underground conduits.

585. Airphoto Interpretation of Engineering Soils. (3-0) Cr 3 S PreReq. 360, Geol 301 or 302A. Recognition, identification and mapping of engineering soils from airphotos. Site evaluation; material reconnaisance, principles and applications of infrared, radar, microwave technology, field chtching.

586. Advanced Soil Engineering Laboratory. (3-0) Cr 3 S PreReq. 421. Study of the properties of soils and civil engineering materials by X-ray diffraction, differential thermal, thermogravimetric and electron beam methods.

586. Advanced Soil Engineering Laboratory. (1-0) Cr 3 S PreReq. 560. Threaf shear, consolidation, permeability, capillarity, seepage forces, stress distribution, reaction of hydrostatic excess pressures to compositional influences. Field load tests.

649. Advanced Topics in Structural Engineering. (3-0) Cr 3 F Prereq: Permission of structural graduate faculty. Advanced concepts in structural engineering topics. Emphasis for a particular offering will be selected from the following topics: A. Behavior of Metal Structures, B. Design of Concrete Shells, C. Cable-Supported Structures, D. Advanced Matrix Analysis of Frames and Continuous Structures.


663. Earth Dams. (2-0) Cr 2 At S, offered 1982 Prereq 560. Location, selection of materials, design, and construction of earth dams. Fee for field trip.


690. Advanced Topics Cr 1 to 3 Prerequisite contract required.

699 Research

Classical Studies

Program Committee: J. Reubel, Chair, A. Avraamides, K. Kwasa, P. Hohenbach, J. Legard

The Classical Studies Program is a cross-disciplinary program in the College of Sciences and Humanities which offers an integrated curriculum of courses in the languages, literatures, history, and thought of ancient Greece and Rome from the time of the Homeric poems to the reign of the Emperor Constantine, while encouraging as well a perspective on the contemporaneity of classical culture, such as the Near East, on its antecedents, such as Mycenaean Greece, and on its heirs in the Middle Ages and Renaissance.

In addition to fulfilling group requirements and electives for all students, courses in classical studies provide significant background for students whose majors are in anthropology, English, foreign languages and literatures, history, music, philosophy, or related fields.

The program committee will assist students interested in planning an individual major or an area of concentration in a distributed studies major. For details of the requirements for such majors within the College of Sciences and Humanities, see Sciences and Humanities Cross-Disciplinary Studies.

Completion of one year of classical Greek or Latin (or the equivalent) is a prerequisite to the minor in classical studies. A student who wishes to declare a minor must then complete at least the following requirements. (a) one additional semester of the same classical language; (b) 371, (c) Hist 402 or 403, (d) six additional credits from the primary courses listed below, or as approved by the program committee.

Primary Courses

371 Greek and Roman Mythology. (3-0) Cr 3 F Survey of the legends, myths, and sagas of the classical world with emphasis on the principal gods, demigods, and heroes, and their implications for ancient social, psychological, and religious attitudes, some attention given to important modern theories.

490 Independent Study. Cr 1-6 each time taken Prereq: 7 credits in classical studies at the 200 level or higher; permission of the chair of the program committee. Designed to meet the needs of students who wish to study specific topics in classical civilization in areas where courses are not available, or to pursue such study beyond the limits of existing courses.

Primary Courses (Departmental)

Art 383 Greek and Roman Art. See Art and Design C. Ork 101, 102. Elementary Greek. See Foreign Languages and Literatures C. Ork 201, 202. Intermediate Greek. See Foreign Languages and Literatures

Eng 333. World Literature: Ancient Classics. See English

Hist 265 Introduction to Ancient Civilization. See History

Hist 280 Introduction to the History of Science. See History

Hist 402 Ancient Greece. See History

Hist 403 Ancient Rome. See History

Hist 495 Proseminar in History. See History

Hist 519A Proseminar in European History: Ancient. See History

Hist 594A Seminar in European History: Ancient. See History

Latin 101, 102. Elementary Latin. See Foreign Languages and Literatures

Latin 201 Intermediate Latin. See Foreign Languages and Literatures

Latin 242 Introduction to Latin Literature. See Foreign Languages and Literatures

Latin 481, 482 Advanced Readings in Latin. See Foreign Languages and Literatures

Phil 310 Greek and Medieval Philosophy. See Philosophy

Pol 340 Development of Political Thought: Classical Thought through Early Contract Theory. See Political Science


Speech 510 Classical Rhetoric. See Speech

Community and Regional Planning

Riad G. Mahayni. Chair of Department Professors: Brooks, Mahayni

Associate Professors: Kinh, Knox, Lex, Malone, Parks

Assistant Professor: Rafter

Undergraduate Study

For undergraduate curriculum in community and regional planning leading to the degree Bachelor of Science, see College of Design, Curricula.

Community and regional planning is concerned with the economic, social, physical, psychological, and management aspects of change in a geographic or political area. The
planner must attain a broad comprehension of city, metropolitan, urban, rural region, and statewide types of development, their interrelationships, and the extent of their changing needs over the short term and the middle- and long-range future.

The curriculum is recognized by the American Planning Association, thus providing the student with an education which, when combined with experience, supports the individual's eligibility towards membership in the American Institute of Certified Planners.

Graduate Study

The department offers work for the degree Master of Community and Regional Planning with major in community and regional planning. Degree requirements include completion of a 2-year, 52-credit program, including a thesis of 9 credits. Minor work is offered to students taking major work in other departments.

The program of graduate study is recognized by the American Planning Association.

By taking work in community and regional planning and by focusing on an area of concentration, the student may develop a program with his or her selection of a special emphasis from administration, economic planning, environmental planning, transportation planning, urban design, housing, and neighborhood renewal, policy analysis, state and regional planning, social planning, and planning in developing countries.

For the degree master of community and regional planning, the foreign language requirement, if any, is established on an individual basis by the program of study committee.

Satisfactory completion of the core requirements and the acceptance of a thesis (9 credits) are required for the M.C.R.P. degree. In addition, the student is encouraged to complete 3 months of acceptable work experience in a planning office between his or her first and second year.

The department participates in the Interdepartmental minor programs in Housing, Transportation Planning, and Technology and Social Change (See Index)

Open to graduate students for minor credit only 380, 405, 406, 416, 432, 492, 493

Courses Primarily for Undergraduate Students

253. Survey of Urban Planning, (3-0) Cr 3 F An historical survey of planning, the nature and problems of urban areas, and the goals, procedures, and results of urban planning.

270. Forces Shaping Our Metropolitan Environment, (3-0) Cr 3 S,S, S,S Introduction to the social, political, physical, and economic forces as they shape metropolitan areas and their interrelationships. A comprehensive picture of metropolitan development showing important roles other urban disciplines play in the planning process and the interrelationships of the disciplines.

272. Planning Analysis and Techniques, (3-0) Cr 3 S Existing and emerging techniques for preparation of community planning studies. Sources of planning information and data, analysis of population, land use, economic, and transportation make-up of a community, activities and location, intensity, and timing of land uses and public services.

283. Environmental Planning, (3-0) Cr 3 F Prereq: Sophomore classification. An overview of the field of environmental relationships and the efforts being made to organize, control, and coordinate environmental, aesthetic, and cultural characteristics of land, air, and water.

320. Regional Practice, Cr 15, F, S, SS, Prereq: Junior classification in community and regional planning. Structured work experience under close supervision of a professional planner. Practical planning experience, relationships between theory and practice, professional responsibilities, and the scope of various planning roles.

341. Travel Cr 1 to 3 each time taken F,S Prereq Classification in community and regional planning. Observed professional practice of community and regional planning. Offered on a satisfactory-fail basis only. Field trips Fee.

380. Regional Planning and Metropolitan Development, (3-0) Cr 3 F Prereq: 253 or 270. Analysis of the growth and changes occurring in non-metropolitan and metropolitan regions, theories and functions of area-wide planning governance structures, policies and strategies for guiding development.

383. Theory of the Planning Process, (3-0) Cr 3 S Prereq: 253 or 270. Introductions and its relation to social and economic planning levels of planning, place of planning in decision making, steps in the planning process, uses and imitation of knowledge in plans of plan aiding. Problems of planning, relation of facts and values.

395. Housing and Neighborhood Revitalization, (3-0) Cr 3 F Prereq: 253 or 270 Guidelines for housing policy formulation as a part of the over-all planning process in urban areas. Analysis of demand, supply, financing, impact of taxation, government regulation and subsidies, and revitalization of neighborhoods through public policy and private initiative.

405. New Towns and Planned Communities, (3-0) Cr 3 S Prereq: 253 or 270. Description of the history and planned community experience in the United States and abroad. Objectives, and policy implications of new towns, various types of new towns and their social, economic, and governance structures. Review of appropriate legislation.

406. State Planning, (3-0) Cr 3 F. Prereq: 253 or 270. Permission of instructor. The state planning process, definitions, state policies, relationships of state, regional, and local policies, current practices, location of the planning function, obstacles to state planning.


432. Urban Development Planning and Programming, (1-8) Cr 4 S Prereq: 272. Utilization of the comprehensive planning process; Preparation of selected development devices for the planning process, such as community revitalization projects, codes and ordinances, and capital improvement programming. Simulation of methods of analysis as applied to a specific geographic area.


492. Planning Law, Administration and Implementation, (3-0) Cr 3 F Prereq: 253 or 270. The basis in constitutional, common, and statutory law for the power of local and state governments to regulate land use and to control zoning, use and location, air, and land pollution. Federal environmental control acts and leading federal court cases.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates


511. Introduction to Community Planning, (3-0) Cr 3 F Prereq: Permission of instructor. Development of planning in the United States, history and evolution of the planning profession and concepts of current practice.

512. Planning Communication, (2-0) Cr 2 F Prereq: Permission of instructor. Methods of graphic, print, and media presentation for the planning professional with emphasis on technical report writing and presentation skills.

515. Housing and Public Policy, (3-0) Cr 3 S Prereq: Permission of instructor. Housing as an interdisciplinary issue: the economic, political, social, and physical restraints on housing and community development.

520. Planning Methods, (3-0) Cr 3 F Prereq: 272 or graduate classification. Basic foundation of planning methods and analytical techniques. Planning information sources and data and their use in the analysis of community issues. Application of scientific method to forecasting of demographic and land use variables.

522. Advanced Planning Methods, (3-0) Cr 3 S Prereq: 272 or graduate classification. Advanced foundations of planning methods and techniques. Analysis of economic base, input-output analysis, employment forecasting, transportation, use of computers and models in planning.

524. Historic Preservation Planning, (3-0) Cr 3 F Prereq: 272 or graduate classification. Historic preservation planning. Methods employed to preserve historical properties. Zoning, transfer of development rights, surveys, preservation plans, public and private financing of preservation.

527. Urban Social Planning, (3-0) Cr 3 S Prereq: Permission of instructor. Review and development of methodologies for planning and programs and implementing social service delivery systems. Federal and state, and local approaches to social and planning policy.

529. Planning in Developing Countries, (3-0) Cr 3 S Prereq: Permission of instructor. A variety of planning and planning-related issues including rural-urban migration, urban problems of planning, regional policies and programs, urban decay, rural development strategies for planning in developing countries.


575. Urban Planning/Urban Management, (3-0) Cr 3 F Prereq: Permission of instructor. The role of planning as part of the management and decision-making process, policy initiation, development, and implementation, management approaches and tools.

590. Special Topics, Cr 1 to 3 F S S

A. Urban Design, Public Policy

B. Historic Preservation

C. Environmental Planning

D. Urban Development Planning and Programming

E. Social Planning

F. Regional and Metropolitan Planning and Programming

G. State Planning

H. Housing

I. New Towns Planning

J. Planning in Developing Countries

592. Planning Law, Administration and Effectuation, (3-0) Cr 3 F Prereq: Graduate classification in community and regional planning. Process of administration and implementation of planning programs through planning law. Effective management of the urban environment. Powers and duties of planning authorities and the powers of plan effectuation, problems of balancing public and private interest as revealed in study of leading court cases.

Courses for Graduate Students, major or minor

699. Research, Cr 1 to 9 S S S
Computer Engineering

Administered by the Department of Electrical Engineering

J. O. Kopplin, Chair of Department

Undergraduate Study

For undergraduate curriculum in computer engineering leading to the degree Bachelor of Science, see College of Engineering, Curriculum.

Computer engineers engage in research, development, design, application, management, and sales in the computer industry and in a broad range of industries in which digital systems and subsystems have application. Computer engineers apply the theories and technology of computing and computers toward improvements in all the range of computing systems and devices that render a service to society.

The department offers a cooperative education program that combines classroom learning at the University with practical engineering experience in industry. Students in this five-year program complete the regular curriculum requirements for the Bachelor of Science degree and acquire carefully planned and supervised work experience at one of the cooperating companies. The first contact with industry comes after the sophomore year. See College of Engineering, Cooperative Programs.

Courses for students who are not in the computer engineering program: 340, 440. Credit in these courses may not be counted toward a degree in computer engineering. Credit in 340 may not be counted toward a degree in electrical engineering.

Credit in only one course in each of the following pairs of courses may be counted toward graduation: 280 and 340; 440 and 487.

Graduate Study

A computer engineering graduate wishing to undertake graduate study will normally do so in electrical engineering or computer science. See Electrical Engineering and Computer Science.

Courses open to graduate students for minor credit only: 340, 384, 385, 387, 440, 480, 481, 482, 483, 487, 488.

Courses Primarily for Undergraduate Students


*287. Digital Laboratory I. (1-2) Cr. 2 F.S. Prereq: 280. E E 125. Use of basic instruments such as logic probes, logic analyzers, oscilloscopes, TTL characteristics. Basic combinational and sequential circuits. Flip-flops, counters, shift registers. Arithmetic logic. Individual design projects.

*398, 399, 498. Cooperative Education. Required of all cooperative students. Prereq: Permission of department head. 298: Work periods for students with sophomore standing in a regularly established cooperative program. 398. Work periods for juniors. 498. Work periods for seniors. Students must register for these courses prior to commencing each work period.


*384. Computer Organization and Design II. (3-3) Cr. 3 F S. Prereq: 340 or E E 205, and 384. Input/output answered, interrupts, direct memory access, peripheral and subsystem interface design with peripherals and devices. Microsystem architectures. Special purpose processor enhancement techniques.


*480. Digital System Design. (3-0) Cr. 3 F Prereq: 345. Design of digital systems including hardware and software. Specifications, life cycle costs, design cycles, documentation (flow charts, block diagrams, logic diagrams, timing diagrams, mechanical diagrams), automated design aids including MASM and automated layout programs. Computer simulation and system problems including noise and reflections, design reliability and redundancy in systems, and the engineering and life cycle costs of software including maintenance and documentation.


*483. Switching Theory. (3-0) Cr. 3 S F Prereq 280. Analysis and synthesis of combinational and sequential circuits.

*487. Introduction to Microprocessors. (3-3) Cr. 4 F S Prereq. 384, E E 436 or 437. Introduction to microprocessors. Microprocessor architecture and associated microcomputer systems. Consideration of peripheral systems parts and hardware/software tradeoffs. Software examples. Top-down designs are explored in a variety of examples.


*495. Honors.

*See paragraphs above course listing for credit restrictions.

Undergraduate Study

For undergraduate curriculum in sciences and humanities, major in computer science, leading to the degree Bachelor of Science, see Sciences and Humanities, Curriculum.

The curriculum in sciences and humanities with major in computer science is designed to prepare students for graduate study in computer science, or for positions as computer scientists with business, Industry, or government. Areas of emphasis exist in programming language structure, systems programming, applications programming, computer system structures, and information structures.

The requirements for an undergraduate major in computer science including the following: 33 credits in computer science, some of which are specified by the Department of Computer Science, with the remainder selected by the student, one of the following sequences in mathematics - Math 165, 166 or Math 175, 176 or Math 150, 151, 307. For additional requirements, see the Computer Science Department.

It is recommended that majors include in their programs of study a strong minor in a field of application of computer science, and, particularly for those who plan on graduate study, one or two years of French, German, or Russian.

Computer science majors may obtain a secondary school teaching certificate by pursuing a cooperative program with mathematics, leading to certification as a teacher of mathematics.

The following courses may not be included in the 33 credits required for the science majors: 170, 172, 200, 201, 470 (except in certain combinations as specified by the Computer Science Department).

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with a major in computer science and minor work to students majoring in other departments.

Facilities exist for fundamental research in such areas as programming languages, computer architecture, operating systems, information structures and theoretical foundations.

A student desiring to do graduate work with a major in computer science should ideally have completed a bachelor's degree or equivalent in computer science. Students with a major in a related area such as electrical engineering or mathematics are also encouraged to apply.

For the degree Master of Science, 31 semester credits are required. Both thesis and non-thesis options are available. If a thesis is required, the preparation of a paper demonstrating ability to organize and express significant ideas in computer science is required.

For the degree Doctor of Philosophy, a student is expected to demonstrate a high degree of proficiency in reading, writing and speaking skills. To insure such skills, the student must include in his program of study a demonstrated proficiency in either a foreign language or in communication skills.

All graduate students are required to pass a series of area examinations over two core areas of the graduate course offerings. The examinations are normally scheduled within the first two years of a student's graduate program.

Computer Science

Robert M. Stewart, Jr., Chair of Department

Professors: Bleday, Keller, Lambert, Maple, Moser, Stewart, Zingg

Associate Professors: Grosenon, Kafura, Oldshoost, Ostendorf, Selman, Straw, Wright

Assistant Professors: Blair, Eckstein, Krishnaswamy, Schneider

109
Courses open to graduate students for minor credit. 311, 332, 352, 375, 411, 432, 441, 470

Courses Primarily for Undergraduate Students

111, 112. Computer Programming I, II, (3-0) Cr 3 ea 111, F S; 112 F Preq 111 Math 140 or 150. 112, 111, and Math 151 or 160 or 165 or 175 A two-semester introduction to computer programming and data structures emphasizing algorithm development and programming style A block-structured language will be used. Emphasis on writing and running programs.

170. Computer Applications and Impact, (2-0) Cr 2 F Preq Sophomore classification. Survey of computer operations, file management, gazing, CAI, process control, unethical and illegal impact of computers on individuals and society. Approaches to problem solving using computers with emphasis on analyses and formulation of algorithms. Projects chosen from various application areas.

172. Computer Programming in FORTRAN, (2-0) Cr 2 F S Preq. Credit or classification in Math 165 or 175 Introduction to computer programming using the FORTRAN language Emphasis on design, debugging, and testing of algorithms. Engineering and physical science applications stressed. For students in engineering and physical science.

175. Applied Computer Programming, (3-0) Cr 3 F S Preq Math 104 or 140 or 142 Introduction to computer programming for non-majors using a block-structured language. Basics of good programming, computer systems, files, query languages.

176. Computer Programming, (4-0) Cr 4 F Preq 175, and Math 151 or 160 or 165 or 175 Computer programming and data structures Emphasis on writing and running programs.

200. Language Proficiency Laboratory, (0-0) Cr 0-1 each language selected F S Preq 111 or 175 Instruction to provide students with a working knowledge of selected, commonly available programming languages.

201. Computer Programming in COBOL, (2-0) Cr 2 F Preq 111 or 175. Computer programming using the COBOL language. Emphasis on the design, writing, debugging, and testing of programs that store and process data using basic computer file concepts.

211. File Organization and Processing, (3-0) Cr 3 F S Preq 111 or 112, and 112, and 221 Concepts and techniques of structuring and processing data external to storage devices. Record and file concepts. Blocking, contiguous and indexed access methods. File utilities. Linked lists and tree structures.

221. Machine Organization and Assembly Language Programming, (3-0) Cr 3 F S Preq. 111 or 117 Organization of computer systems as a hierarchy of levels and languages. Instruction sets and interfacing techniques. Assembly-language programming and assembler construction.

260. Discrete Computational Structures, (3-0) Cr 3 F S Preq Math 165 or 175 or 307. Concepts in discrete mathematics as applied to computer science. Each mathematical topic will be introduced and strongly motivated by coupling it closely with realistic applications to problems of computer science. Propositional logic applied to program correctness, set theory applied to data structures, graph theory and combinational techniques applied to decision trees, Boolean algebra applied to switching theory, and algebraic structures applied to modular arithmetic.

290. Independent Study, Cr arr F S Preq Permission of instructor H Honors.

300. Cooperative Education. Required of all cooperative students. Preq: Permission of department chairman. Students must register for this course prior to commencing each work period.

311. Data Structures and Algorithm Analysis, (3-0) Cr 3 S Preq: 211, 260. Basic techniques for design and analysis of efficient algorithms. Sorting, graph processing, and searching algorithms. The investigation of a simple data base management system will provide an applications environment for topics discussed in this course.

322. Principles of Programming Languages, (3-0) Cr 3 F S Preq: 111. Organization of programming languages emphasizing their run time implementation. Introduction to formal specification of programming languages. Programming in several languages.

326. Introduction to Operating Systems, (3-0) Cr 3 S S Preq: 211, Cpr 384. Survey of operating system issues. Introduction to hardware and software components including processors, peripherals, interrupts, process management, memory management, deadlock, files, system protection, virtual machines and system organization.

357. Applied Information Processing Systems, (3-0) Cr 3 S Preq: 115 and knowledge of COBOL or FORTRAN. Programming in several systems. Concepts and techniques for a hierarchical data structure system. Introduction to systems analysis, working with a job control language, applying access methods, introduction to data base systems, transaction and interactive projects using a business language.


411. Software Engineering, (2-2) Cr 3 S S Preq, 311 Principles and techniques for methodical construction of quality software. Project requirements and objectives, reliability, design methodologies, module specification techniques, testing and validation procedures, proof of program correctness. Emphasis on team projects.

432. Principles of Compiling, (3-0) Cr 3 S S Preq: 260. 312 Techniques of compiler and interpreter construction are studied Lexical analysis, modern top-down and bottom-up techniques, syntax-directed translation, and code generation.


452. Implementation of Operating Systems, (2-2) Cr 3 F S Preq: 352. Laboratory course emphasizing the practical issues of operating systems design and implementation. Structure for a hierarchically structured system. System development, replacements, or extensions to the system will be required as an individual, team project.

470. Computing Methods for Research Workers, (3-0) Cr 3 S S Preq: 111 or 172 or 175 or graduate classification and one course in college level mathematics or statistics. Role of computers in research. Use of computing facilities in research work. Structured problem solving and programming techniques. General analysis of programming languages available for research. Use of utilities, command languages and files in research projects.


490. Independent Study, Cr arr F S Preq Permission of instructor H Honors.

495. Seminar Cr arr F S Preq Permission of instructor H Honors.


531, 532. Theoretical Foundations, (3-0) Cr 3 ea. S F 532: S Preq: 531. 260, 532. Introduction to analytical methods and techniques used in the study of computer science. Finite automata and regular sets, context-free grammars, pushdown automata, Chomsky hierarchy, decidable and undecidable problems, primitive and partial recursive functions, basic recursive function theory and topics from general and automata-based complexity theory.


590. Special Topics, Cr arr Preq Permission of instructor.

599. Nonthesis Research Cr arr.

Courses for Graduate Students, major or minor

610. Seminar, Cr arr.

621, 622. Advanced Theory of Operating Systems, (3-0) Cr 3 ea. 621, 622. Advanced topics in the theory, design, and modeling of operating systems.

641. Semantic Models for Programming Languages, (3-0) Cr S S Preq: 542. Interpretative, denotational, and logically based models of semantics, applications of semantics to program correctness, language specification, and translation.

699. Research.

Construction Engineering

Administered by the Department of Civil Engineering

John G. Russo, Professor in Charge
Professor: Jellinger
Associate Professors: Russo, Ward
Assistant Professors: Chase, Hastings, Ranch, Ringwald, Roth
Instructor: Dickinson

Undergraduate Study

For undergraduate curriculum in construction engineering leading to the degree Bachelor of Science, see College of Engineering, Cumula
Construction engineering is a curriculum administered by the Department of Civil Engineering designed to prepare students for work as professional constructors. Professional construction requires persons with a fundamental knowledge of engineering and management principles, and a knowledge of business procedures, economics, and human behavior. Graduates of this curriculum may expect to engage in preparation of construction cost estimates, construction planning and scheduling, materials procurement, equipment selection, and cost control. The curriculum blends the study of engineering, management, and business sciences to achieve the background required as a constructor. The curriculum offers a choice of three study emphases. These are concerned with building, heavy, and mechanical construction.

Interested, qualified students in construction engineering have the opportunity to participate in a cooperative education program to supplement academic work with work experience in the construction industry. See Cooperative Education Programs, College of Engineering.

Graduate Study

Courses are offered for minor work to students taking major work in other curricula or in interdepartmental programs.

Open to graduate students for minor graduate credit only: 346, 371, 372, 440, 441.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Cr. R. S. Last 8 weeks. An examination of the nature, scope, and extent of the construction industry. An overview of the educational preparation necessary for the constructor in contemporary society.

241. Analysis of Construction Materials and Methods. (3-0) Cr. 3 F.S.S. Prereq: 241 or Arch 301. Examination of construction materials and their administrative uses. Definition, interpretation, and utilization of drawings, specifications, construction contracts, building documents, general and special conditions, and associated contract documents. Definition and administrative aspects of insurance and bonding. Labor management relations and pertinent labor legislation.

296, 396, 498. Cooperative Education. Required of all students in cooperative education. Prereq: Permission of professor in charge. 296: Work periods for students with sophomore standing. 398: Work periods for students with junior standing. 498: Work periods for students with senior standing. Cooperative education students must register in the applicable curriculum prior to commencing each work period.


Relationship between members of the construction team, introduction to scheduling techniques. Not available to construction engineering students for graduation.

371. Construction Organization and Management. (3-0) Cr. 3 F.S. Prereq: 245. Construction company organization, operation, and administration. Proper utilization and direction of manpower at the field and office level. Interactive processes necessary for efficient communication and resolution of field and office construction related problems.

372. Heavy Construction Equipment and Methods. (1-3) Cr. 2 S. Prereq: 241, Arch 346. Field study of the selection and purchase of heavy construction equipment. Application of engineering fundamentals to performance and production and analysis of characteristics and capabilities of construction equipment. Methods of heavy construction project mobilization and site organization. Field trip and fee required.

400. Professional Development. (1-0) Cr. 1 A F S. Eight weeks. Prereq: Senior classification in construction engineering. Employment opportunities, resume preparation, interviewing techniques, professional registration, current changes and problems in the construction industry, and industry associations.


460. Construction Engineering Analysis and Applications. (2-2) Cr. 2 F. S. Prereq: Senior classification in construction engineering. Project analysis and application of construction engineering principles to the solutions of a broad spectrum of construction problems.

490. Independent Study. Cr. 2 to 5 each time taken. F S S. Prereq: Permission of professor in charge. Individual study in construction engineering with emphasis in the field of construction operations, engineering, or technology.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates


565. Case Histories in Construction Documents. (3-0) Cr. 3 S. Prereq. 371, E 480. Study of cases involving disputes encountered by management in construction contract documents. Analysis of common points of dispute and methods of avoiding disputes among the owner, architect, engineer, and construction contractor for a project.

570. Marketing Construction Services. (2-0) Cr. 2 F. Prereq: 371. Specific functions involved in marketing construction services. Need for construction marketing, market area and research, planning and objectives, operation, and personnel. Areas of image, publicity, job site arrangement, and promotional activity. Analysis techniques and analysis of existing construction company marketing systems.

590. Special Topics. Cr. 2 to 5 each time elected. F S S. Prereq: Permission of professor in charge. Study and report preparation in selected areas of construction materials, equipment, operations, planning and scheduling, and management.

Design Studies

Herbert W. Gottfried, Associate Dean of Design
Professors: Brooks, Gottfried
Associate Professor: Robinson
Assistant Professor: Maehling

Undergraduate Study

Courses listed below are offered for students in all university curricula.

Graduate Study

The following courses are offered for graduate minor work: 426, 490, 580.

Courses Primarily for Undergraduate Students

121. History of Design. (3-0) Cr. 3. F.S. Study of issues and artifacts, their relation to the traditional and changing role of the creators, and to western culture.

127. Non-Western Environmental Arts. (3-0) Cr. 3. F.S. Interrelationships of architecture, landscape architecture, urban design, public sculpture, and related arts in the non-western world.

137. Design and Society. (3-0) Cr. 3. F.S. Introduction to select contemporary design issues and modes of professional design activity in relation to the broader dimensions of individual and social life. Issues range from the personal demands of creative expression in professional development to the challenge of shaping human environments to meet social needs.

140. Fundamentals of Visual Expression and Communication. (1-6) Cr. 3. F.S.S.S. Prereq: Credit or classification in 121 or 137 or Art 102. Introduction to drawing and fundamentals of visual expression and communication, with emphasis on design elements and principles, perception, and visual literacy.

145. Design Studio. (1-5) Cr. 3 F.S. Prereq: 140. Introduction to the interdisciplinary nature of the roles of the art and design professions in dealing with the designed environment and the "greater" environment.

226. The Design Process in the Environmental Arts. (3-0) Cr. 3. F. T. The role of designer, materials, and processes involved in the creation of various environmental arts.

248. Criticism of Design. (3-0) Cr. 3 F.S. Prereq: Arch 321 or Art 280 or CRP 383 or LA 271. Developing and exercising a process of critical evaluation of designed objects varying in size and complexity.

446. Studio Design. (1-6) to 1-15) Cr. 3 to 5. F.S. Prereq: Permission of instructor. Interdisciplinary design problems of increased complexity.

490. Interdisciplinary Studies. Cr. 2 to 5 each time taken. Prereq: Permission of instructor. An interdisciplinary approach to the examination of a topical issue of interest to the College of Design. Faculty from more than one discipline.

490. Independent Study. Cr. 2 to 4 each time taken. Prereq: Permission of instructor. An interdisciplinary approach to the examination of a topical issue of interest to the College of Design. Faculty from more than one discipline.
Earth Sciences

Bert E. Nordlie, Chair of Department

Professors: Biggs, Lemish, Nordlie, Seifert, Vondra, Yarger

Emeritus Professors: Hussey, Roy

Associate Professors: Cody, Deluca, Hallberg, Palmquist, Rahman, Takle

Assistant Professors: Chen, Dobosy, Jacobson, C. Richardson, S. Richardson, Sayre, Vaughan, Windom

Undergraduate Study

The department offers courses in geography, geology, and meteorology. Majors can be earned in earth science, geology, and meteorology leading to either the Bachelor of Science or Bachelor of Arts degree. A geography program is available within the earth science major. Candidates for all degrees must satisfy the requirements established by the College of Sciences and Humanities (see Sciences and Humanities, Curriculum). In addition, the department has requirements for each major.

The earth science major is a broad program that typically emphasizes an interdisciplinary field. Programs leading to the Bachelor of Science degree may be individually designed but will include required courses in geography, geology, and meteorology; and required supporting work in physics, chemistry, and mathematics. Suggested specific programs have been designed in certain fields such as land use planning and environmental studies. Programs leading to the Bachelor of Arts degree emphasizing geography and earth sciences teaching are available. The latter program must satisfy the requirements of the Teacher Education Program (see Sciences and Humanities, Cross-Disciplinary Studies). The Bachelor of Science in geology stresses the needs of the professional geologist. Required geology courses total 48 credits and include Geol 100 or 210, 211, 231, 241, 302A, 341, 355, 365, and 471 plus 7 or 8 credits of electives in geography courses. Required supporting courses include Chem 163, 163L, 164, 164L, Phys 221, 222 and 224, Math 175, 176 and 265, and an introductory level statistics course. The Bachelor of Arts in geology allows more breadth in course work with fewer requirements and more electives. Geology requirements total 39 credits and include Geol 100 or 210, 211, 231, 241, 302A, 341 and 355 and 8 credits in geology electives. Required supporting work includes Chem 163, 163L, 164L, Phys 221, 222 and 224, Math 175, 176 and 265, and an introductory level statistics course. The Bachelor of Arts in geology allows more breadth in course work with fewer requirements and more electives. Geology requirements total 39 credits and include Geol 100 or 210, 211, 231, 241, 302A, 341 and 355 and 8 credits in geology electives. Required supporting work includes Chem 163, 163L, 164L, Phys 221, 222 and 224, Math 175, 176 and 265, and an introductory level statistics course. Students majoring in meteorology usually earn the Bachelor of Science degree. The program normally includes the following courses: Meteor 206, 301, 302, 341, 342, 443, 454, and 455. Supporting work required includes Chem 163, 163L, 164; Phys 221, 222; Math 165, 166, 265, 266; Com S 172; Stat 105. For students anticipating graduate study, minor work is recommended in a mathematical or physical science. Other students can choose a wide range of supporting courses that meet their interest in meteorology. A strong background in geography can be obtained with the earth science Bachelor of Arts degree. In addition to the core courses in geography, there is a wide range of supporting courses in other departments. Programs leading to a concentration in either physical or cultural geography are designed on an individual basis.

Graduate Study

The department offers programs leading to the Master of Science and Doctor of Philosophy with majors in earth science, geology, and meteorology. The department also cooperates in the interdepartmental program in Water Resources (see Index). Students desiring a major in the above fields normally will have a strong undergraduate background in the physical and earth sciences. Individuals desiring to enter a graduate program are evaluated by considering their undergraduate preparation and their expressed goals.

Programs of study are designed on an individual basis in accordance with requirements of the Graduate College and established requirements for each departmental major. Minor work is normally taken in aerospace engineering, chemistry, computer science, engineering mechanics, mathematics, metallurgy, physics, soils, soils engineering, statistics, and zoology. Departmental requirements provide a strong, broad background in the major and allow considerable flexibility in the program of each individual. A dissertation is required of all Ph.D. candidates. M.S. students normally are required to complete a thesis, although a nonthesis option is offered for the M.S. degree in earth science and in meteorology. The department requires all graduate students to do some teaching as part of their preparation for an advanced degree. Candidates for the Ph.D. degree are required to submit proofs of reading knowledge of two foreign languages or reading and speaking knowledge of one. The candidate's graduate committee may accept, as proof of mastery, either course grades in language courses taken at Iowa State University or a suitable score on a comprehensive examination.

The following courses are open to graduate students for minor graduate credit only: Geog 324, 490, 495, 496, 497, 511, 515, 355, 365, 380, 390, 398, 471, 482, 484, 486, Meteor 301, 302, 341, 342, 406, 443, 454, 455.

Geography (Geog)

Primarily for Undergraduate Students

100. Principles of Geography, (3-0) Cr. 3 FS Rahman Introduction to the geographer’s view of the world: regionalization, spatial interaction, people-land relationships, urbanization, development, and underdevelopment. Urbanization, emphasis on applied examples.

202. Physical Geography, (2-2) Cr. 3 S The study of the physical characteristics of earth’s atmospheric, hydrographic, and biogeohic systems as they relate to climate, soil, and landscape development and the impact of their spatial distribution on occupants of earth. Field trips.

301. Cartography, (C E 301) (1-4) Cr. 3 F Rahman Basic principles of cartographic communication, transformation, cartographic geometry, and projection; symbolism; history of cartography; Lawvere-valuation systems applied; skills: map design, compilation, drafting, lettering, reproduction. Students required to purchase drafting kit and lab materials.

324. Cultural Geography, (2-0) Cr. 2 F Rahman Ongin distribution and influence of cultural processes such as discovery, invention, evolution, and diffusion of phenomena on the landscape.


326. Man and Land in Anglo America, (2-0) Cr. 2 Alt S, offered 1982 Rahman Analysis of the physical and cultural features that characterize and differentiate the landscapes and regions of the United States and Canada.

328. Europe, (2-0) Cr. 2 Alt S, offered 1983 Rahman Techniques of study of areal variation in the physical and human environment; management of resources, settlements, political, and economic developments.

484. Remote Sensing for Environmental Analysis, (Geol) See Geology.

486L. Remote Sensing Laboratory, (0-2) Cr. 1 Alt F. Prereq. 100, permission of instructor. Correlated readings and field work. Four to six week field trip to a selected region in the U.S. or abroad to study cultural or physical geographic relationships. Written report required.

Geology (Geol)

Primarily for Undergraduate Students

100. Geology and Man, (2-0) Cr. 3 F.S.S. Plimpton Origin of earth materials, landforms, and structures, emphasis on those aspects important to understanding the human environment. Optional field trips, lab fee.

203. Geology Field Trip, Cr. 1 each time taken Fs Prereq. 100, permission of instructor. Vondra. Geology of selected regions studied by correlated readings followed by a field trip to points of geological interest. Ten day field trip required. Field trip fee.

205. Introduction to Oceanography, (2-0) Cr. 2 S Deluca Principles and concepts in oceanography as a basis for understanding the uses, potential uses, and limitations of oceanic materials.

207. Geologic Environment and Hazards, (2-0) Cr. 2 S Rahman 100 Deluca Application of geological concepts to the analysis of the interaction between people and the geologic environment—volcanoes, groundwater, coastal environments, and the like.

210. Principles of Modern Geology, (3-2) Cr. 4 FS Prereq. High school chemistry or physics. Seifert, Windom. Earth materials, processes and history from the atomic to global scale, emphasis on application of physical and chemical concepts to geologic phenomena. Primarily for science majors. Field trip, lab fee.

211. History of the Earth, (3-2) Cr. 4 S Prereq. 100 or 210. Seifert. The early history of the physical and biological evolution encompassing concepts of global tectonics. Emphasis on methods used to decipher earth history.


290. Independent Study. Cr. 2 to 4 each time taken. Prereq. Permission of instructor.

301. Geology for Engineers, (1-2) Cr. 2 FS Lemish, Richardson. Fundamentals of geology with engineering applications. Field trips.

302A, 302B. Summer Field Studies. Cr. 6 to 8 SS Prereq. 231, 241, 355, Vondra. 302A. Areal mapping, structural, stratigraphic, and geomorphologic analyses. Written reports with appropriate illustrations required. An 8-week summer field course required of all non-geology, earth science majors.

314. Determinative Mineralogy, (2-3) Cr. 3 F Rahman, 241, Phys 112 or 222 (preferred), Math 175, Biggs. Technique oriented study of mineral determination. Relationships between crystallographic, chemical, and optical properties.
355. Structural Geology. (2-4) Cr. 4 S Prereq: 100 or 210. Phys 111 or 221 (preferred). Math 175. Lehman. Descriptions and classifications of geologic structures, sedimentary, metamorphic, and igneous rocks. Introduction to mechanical principles as related to disectional behavior of rock bodies in different environments. Laboratory. Includes application of geometrical techniques to solve structural problems. Emphasizes interpretation and use of stereonet.


380. Introduction to Geophysics. (3-0) Cr. 3 F Prereq: 302A, Phys 112 or 222 (preferred). Sayre. Application of physical principles to determination of subsurface rock structure or boundaries or both. Includes seismology, gravimetry, magnetometry, and techniques of electrical and radioactivity surveying. Field application of geophysical methods to include data acquisition, computer processing and interpretation. Fee.


570. Principles of Stratigraphy. (3-0) Cr. 3 F Prereq: 100, 101. Vondra. Basic concepts in stratigraphy; stratigraphic subdivision and nomenclature, correlation, facies and facies analysis, sedimentary tectonics, and basin analysis.

575. Quaternary Geology. (3-0) Cr. 3 S Prereq: 471. Lehman. Character and interpretation of landforms and sediments formed during the Quaternary. Field trips.

576. Clastic Sedimentation. (2-2) Cr. 3 S Prereq: 570. Vondra. Interpreted clastic sedimentary rocks to infer processes, environments, and tectonic settings under which they formed. Major clastic facies of selected regions studied and analyzed. Field trips.

577. Chemical Sedimentation. (2-2) Cr. 3 S Prereq: 577. Vondra. Interpreted chemical sedimentary rocks to infer processes, environments, and tectonic settings under which they formed. Major clastic facies of selected regions studied and analyzed. Field trips.

582. Advanced Economic Geology. (3-0) Cr. 3 F Prereq: 482, 560. Lehman. Review of major principles related to ore concentration and deposition. Geology applied to exploration of mineral deposits and fossil fuels. Problems related to ore genesis.

585. Geoelectronics. (2-0) Cr. 2 S Prereq: 365, 471. Windom. Global geoelectric model within the framework of paleolectons. Continental drift, sea-floor spreading, the nature of the crust and mantle, Island arcs and continental margins, magmatism and metamorphism, palaeomagnetism and seismology.


587. Meteorology. (2-2) Cr. 3 S Prereq: 585, 586. Windom. The phase rule and phase diagrams as a basis of mineral equilibria. Interpretation of geometrical principles as related to disectional behavior of rock bodies in different environments. Laboratory. Emphasis on pressure, two phase diagrams. Special emphasis on effect of pressure, both lithostatic and fluid, including Pots, P D, and mixed volatile fluids.

590. Special Topics. Cr. 1 to 3 each time taken.
Courses for Graduate Students, major or minor

605. Micrometeorology. (3-0) Cr 3 Alt F Prereq 443 Physical processes in the atmosphere near the ground, laminar and turbulent flow, transfer of heat, mass, and momentum, eddy diffusion; statistical theories of turbulence, wind and temperature profiles near the surface, evaporation.

641. Atmospheric Radiation. (3-0) Cr 3 Alt S Prereq Math 266 Solar and terrestrial radiation, radiative transfer equation, Stokes parameters, polarization

699. Research. Cr Var

Economics

Raymond R. Beneke, Chair of Department
Professors: Arthur, Baumel, Beneke, Boehije, Faden, Fletcher, Fox, Fuller, Futrell, Gratto, Hart, Harris, Heady, Hoyt, James, Kolmer, Ladic, Lapan, Luckett, Merrill, C. W. Meyer, Paulsen, Prescott, Scott, Skadberg, Starleaf, Stephenson, Thomas, Timmons, Van de Watering, Wisner

Emeritus Professors: Davey, Howell, Murray, Ogg, Shepard, Wright


Assistant Professors: Abrahams, Alt, Calkins, Dahlgrin, Deter, Edwards, Falk, Ginder, Jolly, W. H. Meyers

Economics

Graduate Study

The department offers work for the degree Bachelor of Science with major in agricultural business, and for the degrees Bachelor of Science and Bachelor of Arts with major in economics. For further discussion of programs in agricultural business, see the statement under College of Agriculture. For programs in economics, see the statement under College of Sciences and Humanities.

College of Agriculture

For the undergraduate curriculum in agricultural business, see College of Agriculture, Curricula

Students majoring in agricultural business must select one area of specialization from economic analyses, public policy, farm management, agribusiness management, agricultural finance, or agricultural sales and marketing. The curriculum prepares students for advanced studies and for careers in farm and ranch operations, commercial farm management and appraisal, agricultural finance, agricultural supply and marketing industries, research for business firms, agricultural reporting and public relations, agricultural extension, and government service.

College of Sciences and Humanities

Candidates for either the Bachelor of Science or the Bachelor of Arts degree with major in economics must fulfill requirements established by the College of Sciences and Humanities. (For details of undergraduate curricula in sciences and humanities, see Sciences and Humanities, Curriculum)

Besides fulfilling the group requirements of the College of Sciences and Humanities, the Department of Economics requires for the degree Bachelor of Science the inclusion of

Engl 414 in the communication group. Within the mathematical and natural sciences group requirements, the economics major is required to take both Math 150 and 151, or 150, 165, and 166. Math 175 and 176 may be taken instead of 165 and 166, if desired. Also required to be included in the mathematical and natural sciences group for the Bachelor of Science degree in economics is one course in statistics and one course in computer science, each at the appropriate level from the economics majors.

Within the College of Sciences and Humanities social sciences groups, the economics major is not allowed to use any economics courses to fulfill the minimum requirement. Besides these departmental requirements, 27 credits in economics are required for majors in economics. For the bachelor of science degree in economics these 27 must include Econ 201, 401, and 402.

For the degree Bachelor of Arts, the Department of Economics requires that Engl 414 be included in the communications group. Within the mathematical and natural sciences group requirements, the economics major is required to take both Math 150 and 151, or 150, 165, and 166 and one course in statistics at the appropriate level for the student. Math 175 and 176 may be taken instead of 165 and 166, if desired. The degree Bachelor of Arts in economics should include a broad array of courses outside the Department of Economics in the social sciences group and the arts and humanities group. Twenty-seven credits in economics are required for the Bachelor of Arts degree in economics, including Econ 201, 312, 401, and 402.

For the degree Bachelor of Arts, the Department of Economics requires that Engl 414 be included in the communications group. Within the mathematical and natural sciences group requirements, the economics major is required to take both Math 150 and 151, or 150, 165, and 166 and one course in statistics at the appropriate level for the student. Math 175 and 176 may be taken instead of 165 and 166, if desired. The degree Bachelor of Arts in economics should include a broad array of courses outside the Department of Economics in the social sciences group and the arts and humanities group. Twenty-seven credits in economics are required for the Bachelor of Arts degree in economics, including Econ 201, 312, 401, and 402.

College of Agriculture

For the undergraduate curriculum in agricultural business, see College of Agriculture, Curricula

Students majoring in agricultural business must select one area of specialization from economic analyses, public policy, farm management, agribusiness management, agricultural finance, or agricultural sales and marketing. The curriculum prepares students for advanced studies and for careers in farm and ranch operations, commercial farm management and appraisal, agricultural finance, agricultural supply and marketing industries, research for business firms, agricultural reporting and public relations, agricultural extension, and government service.

Graduate Study

The department offers work for the degree Bachelor of Science and Doctor of Philosophy with majors in economics and agricultural economics, and minor work to students taking major work in other departments

Prerequisite to major work in the department is the completion of undergraduate work in economics, mathematics, statistics, and other social science and technical subjects substantially equivalent to that required of undergraduate students majoring in economics or agricultural business.

Candidates for the degree Bachelor of Science are required to complete satisfactorily 30 credits of acceptable graduate work, including preparation of a thesis

With the approval of the program of study committee candidates for the degree Bachelor of Science may fulfill requirements by satisfactorily completing 36 credits of course work, in which case preparation of a thesis is not required

Programs of study for the doctorate are organized by each student in consultation with the major professor and the individual's committee. Students may select fields of concentration from the following: agricultural marketing and price analysis, agricultural production, finance, and policy; econometrics, economic growth, development, and planning; history of economic thought, industrial organization and regulation, international economics, labor economics; mathematical economics; monetary economics; natural resource economics; public finance, regional-urban economics.

Each student is expected to achieve a minimum competence in economic theory as demonstrated by completing basic and advanced courses in microeconomic and macroeconomic theory and by completing a writing qualifying examination. Examinations are also required in two other fields selected from the list above. An outside minor, such as statistics, mathematics, or computer science, can be substituted for one of the fields.

Cooperative programs of study may be arranged with the University of Iowa College of Law or with other recognized institutions.

The department also cooperates in the interdepartmental programs of Industrial Administrative Sciences, Industrial Relations, Technology and Social Change, Transportation Planning, and Water Resources (See Index)

Courses open to graduate students for minor credit only. 401, 402, 404, 405, 406, 410, 411, 421, 430, 435, 436, 445, 446, 447, 451, 455, 461, 465, 480, 495, 496

Courses Primarily for Undergraduate Students

110. Orientation In Agricultural Business. (1-0) Cr R F Field of agricultural business, introduction to various occupations, facilities, and the trend of the business.

130. Farm Business Practices. (2-0) Cr S For two-year and winter programs in farm operation only Farm records and accounting practices for farm and farm management. Business and economic principles of decision making in farm decisions in farming, improvements and machinery. Price considerations for crop and livestock production and marketing

192. Agrilusiness Operations. (4-0) Cr 4 F S Application of accounting, business management, and economic principles to the operation of agricultural firms. Functions of management, financial statements, merchandising, personnel administration, production, marketing, trade, agricultural policy, resources, population. Fee for visits to representative agricultural businesses.

1201. Principles of Economics. (4-0) Cr 4 F S SS Meaning, purpose, and role of economics, demand and supply, national income and employment, fiscal and monetary policy, the banking system, pricing and the market system, market structure, international trade, balance of payments, and rates of exchange

1203. Introduction to Principles of Micro-Economics (2-0) Cr 2. F Prereq Math 165 or 175. Problems of resource allocation, demand and supply, national income, employment, and price levels, fiscal and monetary policy, operation of the banking system, elements of international finance, and fiscal policy

1204 Introduction to Principles of Micro-Economics (2-0) Cr 2 S Prereq 203. Theories of production and consumption, pricing, and the market system, perfect and imperfect competition, business and labor regulation, elements of international trade

250. Public Interest Economics. (2-0) Cr 2 F S Prereq 201 or 204. Application of political economy to broad areas of citizen concern. Economic analysis of such issues as energy, environment, health, corporate responsibility, and consumer protection. Students may be required to work in task forces and to participate in one day of manual labor in a community project

304. Money and Banking. (3-0) Cr 3 F SS Prereq 201 or 203. History and theory of money, market structure of banking, bank management, money and capital markets, nonbank financial institutions, central banking, monetary theory, international monetary arrangements, monetary policy

305. Comparative Economic Systems (3-0) Cr 3 F S Prereq 201 or 204. Analysis and comparison of alternative economic systems, particularly capitalism, democratic capitalism, socialism, market socialism, and command socialism. Contemporary systems examined include those of the United States, France, Sweden, Yugoslavia, Soviet Union, and China. Emphasis on underlying theory, institutions, and selected problems associated with respective economic systems, prospects for institutional change and convergence

312. History of Economic Thought. (3-0) Cr 3 S. Prereq 201 or 204. History of economic thought as related to the intellectual history of the times. Major persons treated include Smith, Ricardo, Marx, Marshall, and Keynes

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market structures, information, grading, alternative measurement and arrangement, futures, markets, government regulation.

532. Quantitative Research and Decision Models. (3-0) Cr. 3 S Prereq: 501, credit or classification in Stat 401. Use of statistical, economic, and other social science models to study marketing problems. Applications to public and private decision making.

535. Economic Development and Transformation of Agriculture in Developing Countries. (3-0) Cr. 3 S Prereq: 501, offered 1982. Role of agriculture in economic development of developing countries, development to factor prices, firm structure and technology, role of government policies, firm behavior, and aggregate food response, improvement and communication, capital and natural resource problems under various developmental stages, equity problems.

536. Dynamic Economic Analysis. (3-0) Cr. 3 S Prereq: 501. Fundamentals of economic theory, difference and differential equations and stability analysis, with emphasis on applications to macro and microeconomic theory, equilibrium and disequilibrium systems. Dynamic techniques and applications to economic theory.

537. Linear and Nonlinear Economic Models. (3-0) Cr. 3 F Prereq. 401, 501. Linear and nonlinear programming, input-output analysis, game theory, Markov chains, dynamic programming and other applied mathematical models in economics.


545. Economics of Taxation. (3-0) Cr. 3 S Prereq 501. Analysis of tax systems and incidence, excess burden and effects of taxes on supplies of labor, capital, and risk-taking, alternate bases for taxation of equity, optimal taxation, economic effects of personal and corporate income taxes, payroll taxes, sales taxes, wealth and property taxes, the burden of debt, fiscal federalism.


551. Monetary Theory. (3-0) Cr. 3 F Prereq 503. The monetary mechanism, neutrality theory, neo-Keynesian monetary theory and the portfolio approach, microeconomic aspects of monetary theory including the measurement of cost of capital, rate of interest, expectations, and lag in effect of monetary policy. Money supply theory.

552 Advanced Money and Banking. (3-0) Cr. 3 S Prereq 503. Advanced topics in monetary economics, including monetary policy in banking, models of commercial bank behavior, term structure of interest rates, instruments of monetary control, debt management, effectiveness of monetary policy.

555. International Trade. (3-0) Cr. 3 F Prereq 501. Modern theory of international trade, welfare and distributional aspects of trade and tariffs. The interdependence of international trade and economic growth, the role of trade in the economies of the underdeveloped countries, comparison of cost savings and benefits, exchange rate determination.

557. International Finance. (3-0) Cr. 3 S Prereq. 503. Theories of exchange, mechanisms of adjustment to balance of payments problems such as devaluations, monetary and fiscal policies, and exchange controls, international financial markets and the role of central banks in international economies. Exchange speculation, evolution of the international monetary system, capital movements, the phenomenon of international inflation.


562. Agricultural and Food Policies and Programs. (3-0) Cr. 3 S Prereq 501. Description, analysis, and evaluation of domestic and international policies and programs influencing agricultural productivity and allocation, farm product, food and input prices, income distribution, world food situation, international trade in agricultural commodities.


566. Regional-Urban Economics. (3-0) Cr. 3 Alt F, offered 1982. Prereq 501. Theories of city growth, regional development models, central places and urban hierarchies, migration and commuting, city layout, CBD functions, problems of transportation, congestion, pollution and housing, public services.

571. Agricultural Marketing and Price Analysis. (3-0) Cr. 3 Alt S, offered 1981-82. Prereq 501, 504. Selection of topics in economic theory, decision-making under uncertainty, control theory, simulation and computer analysis. Introduction to the advanced literature, including relevant models from other social sciences.

575. Water Resources. (3-0) Cr. 4 F Prereq Stat 405. Selected applications of econometric techniques to models of consumer behavior, cost and production, demand for, and supply of, the financial sector, and microeconomic models. Selected topics of economic problems encountered in applied econometric research.


579 Water Resources. (3-0) Cr. 3 Alt S, offered 1981-82. Prereq Stat 405, 501. Water management categories and beneficial use groups, water demands for various uses. Legal, economic, sociopolitical, governmental and technical aspects of water resources planning and management. Emphasis on systems of rational allocation among competing demands for water Administered by Economics, in cooperation with the departments of Agriculture and Sociology.


590. Special Topics. Cr. 1 to 5 each time taken

A Agricultural Economics
B Economic Development
C Economic Development
D Agricultural Economics
E Public Finance
F Urban-Regional Economics
G Agricultural Marketing and Price Analysis
H Agricultural Economics
I Labor Economics

600. Seminar. Cr. 1 to 3 each time taken Prereq 6 graduate credits in chosen field. Offerings each semester will be selected from the following list:

A Industrial Microeconomics
B International Economics
C Economic Development
D Microeconomic Analysis
E Public Finance
F Urban-Regional Economics
G Agricultural Marketing and Price Analysis
H Agricultural Economics
I Labor Economics

699. Research. Cr. 1 to 6 each time taken

A Agricultural Economics
B Econometrics

*Administered by the College of Agriculture. Courses not marked by an asterisk are administered by the College of Sciences and Humanities.
Electrical Engineering

J. O. Kopplin, Chair of Department

Professors: Basart, Brearley, Brockman, Brown, Camp, Fouad, Hale, Heiseh, Jones, Koerber, Kopplin, Mahmoud, Michel, Nilsson, Pohl, Post, Potter, Read, Smay, Swift, Townsend, Triska, Willett, Zingg

Emeritus Professor: Boast

Associate Professors: Baker, Bond, Carlson, Coady, Cornstock, Fanlow, Honor, Knuepfl, McMechan, Mericle, Musil, Platkowski, Samuels, Scott, Stephenson

Assistant Professors: Anderson, Burns, Cowan, Day, Lacey, Mamanjandu, Pavlet, Thowsen

Instructor: Crow

Undergraduate Study

For undergraduate curriculum in electrical engineering leading to the degree Bachelor of Science, see College of Engineering, Curricula. The department also administers an undergraduate curriculum leading to the degree Bachelor of Science in computer engineering, which is described in College of Engineering, Curricula.

Electrical engineers engage in research, development, design, application, management, and sales in electrical and associated industries. They apply the theories, circuits, and materials of electrical engineering toward improvements in all of the range of electrical devices, methods, and systems that render a service to society.

The curriculum in electrical engineering has been designed to enable the individual to develop his or her imagination and knowledge in order to enter any of these fields according to individual incentives, interests, and talents.

The department offers a cooperative education program that combines classroom learning at the University with practical engineering experience in industry. Students in this five-year program complete the regular curriculum requirements for the Bachelor of Science degree and acquire carefully planned and supervised work experience at one of the cooperating companies. The first contact with industry comes after the sophomore year. See College of Engineering, Cooperative Programs.

Courses for students who are not in the electrical engineering program: 441, 445, 447, 449. Credit in these courses may not be counted toward a degree in either electrical engineering or computer engineering.

Credit for only one member of the following pairs of courses or course sequences may be counted toward graduation: 205/206 and 441; 330/331 and 445; 351 and 447; 436 and 437.

Graduate Study

The department offers courses for the degrees Master of Science, Master of Engineering, and Doctor of Philosophy with major in electrical engineering and minor work to students taking major work in other departments. Minor work for electrical engineering majors is usually selected from a wide range of courses outside the Electrical Engineering Department. The department also participates in the Technology and Social Change and Energy Systems Engineering interdepartmental minors.

The degree Master of Science requires a thesis and is recommended for students who intend to continue toward the Doctor of Philosophy degree or to make a career in research and development. The non-thesis Master of Engineering degree requires an independent study project. Students pursuing a Doctor of Philosophy degree must select one of the following areas of specialization: electromagnetics, computer engineering, control systems, electric power.

The normal prerequisite to major graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of computer engineering students at this University. Because of the diversification in the electrical engineering graduate program, however, it is possible for a student to qualify for graduate study in certain areas of electrical engineering even though his or her undergraduate or prior graduate training has been in a discipline other than electrical engineering. Supporting work, if required, will depend on the student's background and area of research interest. A prospective student from a discipline other than a curriculum in electrical engineering is urged to submit, with the application for admission, a statement of the proposed areas of graduate study.

The department requires submission of GRE aptitude test scores by applicants from other countries. All students whose first language is not English must submit acceptable TOEFL scores.

Interdisciplinary programs between electrical engineering and biomedical engineering are provided jointly under sponsorship by the College of Engineering and the College of Veterinary Medicine. Laboratory facilities are available at the College of Veterinary Medicine, South Campus (See Biomedical Engineering).


Courses for undergraduate students:

205. Electric Circuits I. (3-0) Cr. 3 F.S.; Prereq. Math 186 or 187 Phys 201. Resistive circuits, single time constant transients, sinusoidal analysis, resonance, mutual coupling, operational amplifiers.

206. Electric Circuits II. (3-0) Cr. 3 F.S. 5 S.; Prereq. 205 Transients, polyphase circuits, d-c networks, Fourier series. Laplace transforms in circuit analysis.

212. Elementary Electromagnetics I. (3-0) Cr. 3 F.S. 4 F.S. Prereq. 265 Lump-terminated, distributed-circuit, and field models of physical systems for electrical energy transmission. Transmission line and application to digital signal transmission. Introduction to electric and magnetic field theory. Laplace's and Poisson's equations; numerical solutions.


235. Electric and Magnetic Fields. (3-0) Cr. 2 F.S.; Prereq. 225 Fields and potentials, characteristics of conductors, fields, and the use of vector methods in the solution of problems.


352. Electromagnetic Devices and Electric Machinery Laboratory. (0-3) Cr. 1 F.S.; Prereq. Credit or classification in 235, 351. Experiments with electric and magnetic devices: force and torque measurements, transformers and motors, magnetic circuits, rotating machines, and the digital and solid state control of machines.


413. Transmission Lines and Microwave Engineering. (3-0) Cr. 3 F.S.; Prereq. 313 Transmission lines. Impedance matching. Passive microwave structures. RF amplifier design. Microwave detectors and mixers. Microwave sources. Waveguide hardware.


423. Communication Systems Laboratory. (0-3) Cr. 1 F.S.; Prereq. Credit or classification in 421. Construction and evaluation of modulators, demodulators, and other components for analog and digital communication systems. Design and evaluation of a simple or a complex communication system.


436. Digital Integrated Circuits. (3-3) Cr. 4 F.S.; Prereq. 330, Cpr E 280. Modern logic families: comparison of


6. Electrical Energy Sources. (2-0 Cr. 2) S S Prereq: Senior classification in engineering. A study of direct energy conversion devices and electrical energy storage methods with emphasis on their utilization in solar electric systems.


H. Honors.

*See material above course listing for credit restrictions.*

Courses Particularly for Graduate Students, major or minor open to qualified undergraduates.


510. Topics in Electromagnetics. Cr 1 to 3 S F Prereq: Permission of instructor.

A. Antennas
B. Electromagnetic theory
C. Microwave devices
D. Radio astronomy
E. Contemporary topics

511. Modern Engineering Optics. (3-0 Cr. 3 each topic) Prereq: 412. Each topic offered. Major emphasis will be on one of the following topics.

A. Stimulated emission devices and systems. Lasers, and applications
B. Photoelectrics and holography
C. Optical and hybrid optical-digital computers


simuation, queuing and probability theory techniques applied to quantify the performance and reliability of computer systems and networks.

583. Advanced Switching Theory. (3-0) Cr 3 Prereq: Cpr E 493. Advanced topics in switching theory.


588. Advanced Microcomputer Design. (3-0) Cr 3 Prereq: Cpr E 487. A study of microcomputer system design, involving both software and hardware details and the techniques of an exhaustive survey of modern microprocessors.


590. Special Topics. Cr 1 to 6 each time elected. Formulation and solution of theoretical or practical problems in electrical or computer engineering. Electives offered each semester when offered with a letter suffix, a topic is designated as follows:
A. Electromagnetic theory
B. Control systems
C. Communication systems
D. Circuit theory
E. Computer engineering
F. Electric power
G. Electrical materials
H. Electronic devices and circuits

592. Seminar in Computer Engineering. Cr 1 to 3 each time elected. Prereq: Permission of instructor.

593. Seminar in Control Systems. Cr 1 to 3 each time elected. Prereq: Permission of instructor.

594. Seminar in Electric Power. Cr 1 to 3 each time elected. Prereq: Permission of instructor.

595. Seminar in Electromagnetics. Cr 1 to 3 each time elected. F S: Prereq: Permission of instructor.

A. Antennas
B. Tropospheric and scatter propagation
C. Coherent optics
D. Plasma
E. Microwave power
F. Remote sensing
G. Microwave engineering
H. Radio astronomy

Courses for Graduate Students, major or minor

610. Advanced Topics in Electromagnetics. Cr 1 to 3 each time elected. F S: Prereq: Permission of instructor.

A. Antennas
B. Electromagnetic theory
C. Microwave engineering
D. Radio astronomy
E. Contemporary topics

620. Error Detection and Correction. (3-0) Cr 3 Alt yr as arr Prereq: 583. An introduction to the mathematical foundations of error detection and correction. Shift registers and pseudorandom sequences. Group codes, cyclic codes, implementation of error detection and correction in digital systems.


653. Advanced Topics in Electric Power Engineering. (3-0) Cr 3 each time elected. Prereq: Permission of instructor. Advanced topics of current interest in electric power systems engineering.
A. High voltage engineering
B. System planning
C. System dynamics
D. Probabilistic methods
E. Control and operation
F. Power electronic systems
G. Energy conversion
H. DC transmission systems
I. Lightning and switching surges


674. Advanced Topics in Systems Engineering. (3-0) Cr 3 each time elected. Prereq: Permission of instructor. Advanced topics of current interest in circuit and control theory.
A. Circuit theory
B. System stability
C. Lattice-cascade systems
D. System identification
E. Optimal control
F. Nonlinear systems
G. Stochastic systems
H. Discrete-time systems

685. Advanced Topics in Digital Systems. (3-0) Cr 3 each time elected. Prereq: 585. Advanced topics in computing systems taken from current literature.

690. Advanced Topics Cr var

699 Research Cr var

Elementary Education

Jess R. Beard, Head of Department

Professors: Beard, Breiter, Coulson
Emeritus Professor: Merkley

Associate Professors: Barnhart, Baum, Downs, Henney, Kelly
Assistant Professors: Abelson, Dixon, Uffelflemetry, Jones, Peterson, Shaw, Shirley
Instructors: Britton, Connor, Hoy, Kilmä, Rayman, Sampson, Webb

Undergraduate Study

For the undergraduate curriculum in education, major in elementary education, leading to the degree Bachelor of Science, see Education Curriculum.

The curriculum in elementary education is planned for persons who want to teach at the elementary school level. The department also offers approval programs for elementary teachers of mentally disabled students. Students who enroll in elementary education must make application to and be accepted by the teacher education committee in elementary education and the University Committee on Teacher Education, prior to classifying in advanced elementary education courses. For admission and certification requirements, see College of Education.

Graduate Study

Graduate programs with a specialization in elementary education or learning disabilities and graduate certification programs in learning disabilities and emotional disabilities are administered through the Department of Professional Studies in Education.

Open to graduate students for minor credit only: 450, 451, 457, 460

Courses Primarily for Undergraduate Students

100. Freshman Orientation. Cr 3 F S: Overview of elementary education, curricular opportunities in the major, and program planning. Required of all freshmen majoring in elementary education.

200. Sophomore Orientation. Cr 3 F S: Overview of elementary education, program planning, and application for admission to teacher education. Required of all sophomores majoring in elementary education.

204. Foundations of American Education. (Sec Ed 204) See Secondary Education

226. Development and Guidance in Middle Childhood. (C D 226) See Child Development

240. Literature for Children. (C D 240) See Child Development

250. Education of the Exceptional Learner. (3-0) Cr 3 F S: An overview of exceptional learners. Emphasis on identification, educational and vocational needs, and current practices.

283. Teacher Aide. (Sec Ed 280) See Secondary Education

290. Independent Study. Cr 1 to 3 Prereq: Permission of department head.

300. Transfer Orientation. Cr 3 F S: Overview of elementary education, program planning, and personal development. Required of all transfer students majoring in elementary education.

301. Instructional Media. (See Ed 301) See Secondary Education.


345. Strategies in Teaching. (3-0) Cr 3 F S: SS. Prereq: 250, to be taken concurrently with 375, 445, or 446. Introduction to basic education teaching strategies.

360. Education of the Mentally Disabled. (3-0) Cr 3 Prereq: 586. A study of the physical, emotional, social, and learning behaviors of the mentally disabled as related to education and vocational programs.

365. Analyzing Learning Problems. (3-0) Cr 3 F S: Prereq: 360. Formal and informal diagnostic instruments used by teachers to determine the academic and adaptive behavior levels of mentally disabled students.

375. The Teaching of Reading. (4-0) Cr 3 F S: Prereq: Credit or classification in 250, 345. Approaches to developmental reading in elementary schools, emphasis on basal and content area materials and skills. Field experience teaching reading to elementary school children.

406. Multicultural Awareness and Nonsexism in the Classroom. (Sec Ed 406) See Secondary Education


430. Curriculum for Mildly Mentally Disabled. (3-0) Cr 3 F S: Prereq: 360. Methods and materials employed to teach students with mild mental retardation.

431. Curriculum for Moderately Mentally Disabled. (3-0) Cr 3 F S: Prereq: 360. Methods, materials, and approaches commonly used in teaching functional living skills, self-help skills, social and adjustment, and vocational skills to moderately disabled students.


433. Community Programs for Mentally Disabled Students. (3-0) Cr 3 F S: Programming and sheltered workshop opportunities for mentally disabled adolescents.
Energy Systems Engineering

(Interdepartmental Minor)

William J. Cook, Chair of Supervisory Committee


Minor graduate work is offered in energy systems engineering under a cooperative arrangement with various departments including Aerospace Engineering, Agricultural Engineering, Architecture, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering Science and Mechanics, Industrial Engineering, Materials Science and Engineering, Mechanical Engineering, and Nuclear Engineering.

Staff and facilities exist in several departments to assist the engineer with interest in bulk power or energy systems to pursue either advanced academic training or research. The departments named above are involved with energy systems and all offer opportunities in study and research opportunities. These include: fossil and nuclear power plants; transmission systems; power system analysis and operation; utility rate structure, depreciation, and valuation; engineering economics; energy supply and transport; environmental impact of energy systems; materials utilization and processing; energy resources, conservation, conversion, and utilization; and other energy-related topics.

The normal prerequisite to minor graduate work in energy systems engineering is the completion of undergraduate work substantially equivalent to that required for engineering students at this University. Because of the diversity in energy systems engineering it is possible for students to qualify for graduate study in some of the above areas even though their undergraduate or prior graduate training has been in a discipline other than engineering.

Students minor in energy systems engineering will select a block of courses from an approval list to achieve a stated energy-related objective. A member of the Energy Systems Engineering Supervisory Committee will serve on the student's program of study committee and will assist in defining a suitable minor program. The approved list of courses is available from the chairman of the supervisory committee.

Usually a block of 6 hours will be required as a minor for the master's degree and 12 hours as a minor for the doctoral degree. Energy Systems Engineering (E.E. M.E., Nuc E.543) shall be included in the student's program. The remainder of courses should be selected from those offered in two majors other than the student's major, at least one of which shall be outside the student's department.

Engineering Journalism

Administered by the Department of Industrial Engineering in cooperation with the Department of Journalism and Mass Communication.

Leading to the degree Bachelor of Science in engineering operations. Minimum credits required — 128.5.

A program in engineering journalism has been designed in the engineering operations curriculum for students who desire a knowledge of the fundamentals of management, engineering, science, communications, and human behavior, and who do not wish to pursue the more specialized engineering curricula. Graduates of this program should find interesting opportunities in a number of administrative areas in industry such as technical information, industrial communications, public relations, engineering sales, procurement, and production.

Additional information concerning the journalism courses and requirements may be obtained from the chairman of the Department of Journalism and Mass Communication. Required courses in the engineering journalism program include all the required courses in the engineering operations curriculum except as noted below.

The following number of credits in journalism must be included for the engineering journalism program.

Cr. I. Basic Core Courses

2 Introduction to Mass Communication — JI MC 101
8 Basic Reporting, Writing, Editing — JI MC 201, 202, 203
3 Law of Communication — JI MC 430
1 Professional Seminar — JI MC 499
2 Professional Media Internship — JI MC 499
The curriculum in engineering science is designed particularly for those students who wish to receive comprehensive training in the fundamental principles and concepts of engineering rather than specialize in one particular field. The core of the program, which is based on a background in chemistry, mathematics, and physics, consists of mechanics of solids, mechanics of fluids, nature and properties of materials, electrical theory, thermodynamics, and rate processes. A sequence in analysis and design in the sophomore, junior, and senior years serves to integrate the entire program in engineering science.

The curriculum is well adapted as a base for those students who wish to enter the research, development, or design areas of engineering or who intend to pursue a graduate program in one of the departments of the College of Engineering. By a judicious choice of electives in the senior year, it is possible to go on and attain a master of science or master of engineering degree in either two or three additional semesters beyond the bachelor's degree. Program plans for such integrated bachelor-master degrees are available in a number of professional areas in the College of Engineering for appropriately qualified students—e.g., engineering mechanics, nuclear engineering, biomedical engineering, and civil engineering, as well as in many non-engineering areas.

Graduate Study
Minor work is available to students taking major work in other departments.

Open to graduates for minor graduate credit only; 351, 352, 380, 412, 481, 482, 490, and 491 or 499.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Cr. R. S.
280. Basic Engineering Design I. (3-0) Cr. 3. S Prereq. A FORTRAN computer programming course, credit or classification in E M 274. Numerical methods in design, characterization, and visualization of systems, application of basic principles of mechanics to idealized models and digital and analog computational techniques.

298, 398, 496. Cooperative Education. Required of all cooperative students. Prereq. Permission of department head. 298 Work periods for students with sophomore standing in a regularly established program. 398 Work periods for juniors, 496 Work periods for seniors. Students must register for these courses prior to commencing each work period.


380. Basic Engineering Design II. (2-2) Cr. 3. S Prereq. 280 Design of experiments to measure basic parameters, introduction of experimental data and empirical relationships.


412. Energy Sources and Utilization. (3-4) Cr. 3. S Prereq. Sources of energy, methods of utilization and transformation. Over-all design of energy systems.

481, 482. Advanced Analysis and Design. (3-0) Cr. 3 each yr. Prereq. 481, 380, a fluids course, 482. Application of the engineering sciences to the analysis and design of components and systems.

490. Independent Study. Cr. 2 to 5. Prereq. Permission of department head. Investigation of an approved problem commensurate with the training, interest, and ability of the student.

H. Honors

Engineering Science and Mechanics

Harry J. Weiss, Head of Department

Professors: Burger, Graham, Greer, McConnell.

Associate Professor: Young, Thompson.

Assistant Professors: Rudolph, Sturgis.

Undergraduate Study

The courses in mechanics are intermediate between those in physics and mathematics and the professional and design courses of the several engineering curricula. In the work of this department the student is expected to acquire an understanding of the principles underlying the techniques of analysis and a knowledge of those properties of materials which influence the manner and extent of their use for engineering purposes. Students are expected to gain some insight into the background of purchase and design specifications. Physical properties of engineering materials are studied in the classroom and are evaluated in the laboratory. General laws, such as those of Newton, are given mathematical expression and are made useful for the solution of specific problems in machine and structural design, and in the flow and measurement of fluids.

Graduate Study

The department offers work for the degrees Master of Science, Master of Engineering, and Doctor of Philosophy with major in engineering mechanics, and minor work to students taking major work in other departments.

The Master of Science degree requires a thesis and a minimum of 8 research credits. It has strong research emphasis and is recommended for students who wish to pursue a doctoral program later. At least 30 hours of acceptable graduate work are required for the degree.

The Master of Engineering degree does not require either research credits or a thesis. However, at least 2 credits of acceptable creative endeavor and at least 26 credits of acceptable graduate course work are required. A minimum of 30 credits of acceptable graduate work is required for the degree. The program is intended to give students additional instruction at the graduate level to better qualify them for advanced professional engineering work. By careful selection of electives and perhaps additional courses during the senior undergraduate year, students should be able to qualify for the master of engineering degree with an additional year of full-time study after receiving their baccalaureate degree in one of the several engineering curricula.

For the undergraduate curriculum in engineering science leading to the degree bachelor of science, see College of Engineering, Curricula.

571, 572, Advanced Fluid Mechanics. (M.E 571, 572) 571, 572. (3-0) C. 3, F. 573. (3-0) C. 3, S. Prereq.
571: 378 or M E 335, 572: 571. Fundamental relationships of fluid dynamics, real and ideal fluids, laminar and turbulent flow, flow in closed conduits and open channels, boundary layer theory, two- and three-dimensional potential flow problems, engineering applications. 572. Application of complex variables to two-dimensional fluid flow, or fluid and solid bodies free streamline theory. Exact and approximate solutions to Navier-Stokes equations for one- and two-dimensional potential problems, both steady and unsteady flows, exact and approximate solutions to one- and two-dimensional boundary layers, introduction to turbulent boundary layers. Application to engineering problems.

580. Biomaterials. (B.M.E 580; M.S E 580) (3-0) Cr. 3 S Prereq. permission of instructor. Basic chemical and physical properties of biomaterials related to manipulation by the engineer for incorporation into living systems. Role of microstructure in properties in the choice of biomaterials and design of artificial organs, implants, and prostheses.

590. Special Topics. Cr. 1 to 4 each time taken
A. Advanced Engineering Acoustics
B. Linear Wave Propagation
C. Thermal Stress in Design
D. Linear Viscoelasticity
E. Biomaterials
F. Other Topics

Courses for Graduate Students, major or minor

620. Seminar. (1-0) Cr.


648. Advanced Topics in Dynamics. (3-0) Cr. 3 Alt S. offered 1983 Prereq 548, Math 385. Topics of current interest in dynamics such as vehicle stability, modeling multicomponent dynamical systems and nonrigid body dynamics.

650. Fluid Mechanics Seminar. (M.E 650; Aeron 650) (1-0) Cr. 1 each time taken. Prereq. permission of instructor. Special topics of current research interest to students and staff of departments concerned.

651. Advanced Topics in Fluid Mechanics. (M.E 651) (3-0) Cr. 3 S Prereq. 572. Topics of current interest in fluid mechanics such as separation phenomena, three-dimensional boundary layers, unsteady flow phenomena, asymptotic methods in viscous flows, stability, theory of homogeneous isotropic turbulence, and turbulence models.


690. Special Topics. Credit 1 to 6 each time taken
A. Advanced Experimental Mechanics
B. Nonlinear Wave Propagation
C. Nonlinear Material Behavior
D. Composite Materials
E. Holography in Mechanics
F. Finite Element Engineering Continua
G. Fracture Mechanics
H. Atmospheric Fluid Mechanics
I. Viscous Flow Theory
J. Advanced Similarity Analysis
K. Advanced Analytic Methods in Mechanics
L. Rheology
M. Creep and Component
N. Other Topics

699. Research.

English
Frank E. Haggard, Chair of Department


Emeritus Professors: Huntress, Mallam, McCay

Associate Professors: Consigny, Cummings, R. R. Davies, Lilian O. Feinberg, Fowler, L. R. Galyon, Gwiasda, Inwos, LaSalle, McCarty, Nakadate, Nostwich, Ross, Slet, Speer, Zimmerman

Instructors: Beaity, Boston, Buckels, David, D. W. Dunlop, M. H. Dunlop, Fry, Miller, Moore, Pearson, Sears, Rohn, Tedlock, Thralls, Underwood, Wiggers

Undergraduate Study

The department offers a wide variety of courses for students seeking a degree in English, as well as for students wishing to broaden their general education. Course offerings include American, English, and world literature; basic and upper-level practical and creative writing, linguistics, film, reading, English education, and English for speakers of other languages.

Many students select English courses to fulfill electives, to pursue a minor, to complement their professional training in other departments, and to investigate possible further study in English. The discipline of English helps to develop students' understanding of how language functions in imaginative literature, mass media, and both personal and professional writing.

Basic courses in the department are designed to improve the skills in comprehension and communication necessary for successful university work. (See Colleges and Curricula, English and communications requirements.) The English Department has a Writing Center and a Reading Center (including English 200) to assist students seeking intensive instruction in these skills. The curricula in many departments call for course work beyond the freshman English program.

The department offers a variety of special courses in English for speakers of other languages (both undergraduate and graduate students) and participates in the Intensive English and Orientation Program for foreign students (See English Courses for Native Speakers of Other Languages and English Requirement for International Students.)

Students graduating with a major in English or with a large number of courses in English usually find that their career opportunities are improved in those fields that demand special communication skills, e.g., advertising, sales, public relations, technical writing, publishing, business, public service, education, and financial services. An undergraduate major in English is an excellent basis for professional study in law, medicine, and theology. Students interested in teaching can qualify to teach in the secondary schools. (See College of Education for teacher certification requirements.) Students who have completed an undergraduate major in English may also pursue graduate studies.

The English major, aided by an adviser, works out a program of study consistent with his or her own educational and professional objectives. Majors are required to have at least 30 credits in English, and a grade of B in addition to 104-105 or 106H, those seeking secondary certification are required to have an additional 9 credits in English, apart from courses in teaching methods. Credits are distributed as follows: basic courses in each of the department's three main areas — composition, language, and literature, an additional two courses from the British literature series 375-378 and two courses from the American literature series 360-363; and an additional two courses (or one course for majors seeking certification) selected from 366, 370, 391, 392, 449, 473, 474, 489. Furthermore, two of the courses are to be in British or American literature before 1800.

Majors who do not declare a minor or a second major are urged to take at least 12 credits in a supporting field such as foreign language, linguistics, journalism, history, philosophy, psychology, speech, music, sociology, anthropology, women's studies, American Indian studies, and business administration. English majors may earn a Bachelor of Arts or Bachelor of Science degree. The B.S. degree requires additional work beyond the minimum college requirements in linguistics, science, mathematics, or social science. Details of these requirements are available from departmental advisers.

The English Department each year offers several scholarships and awards of modest sums. Most of these are open to all undergraduates and are as follows: the English Activities and Recognition Club Scholarships, the James and Rachel Lowe Award, the Critical Writing Award, the Pearl Hogrefe Award, the Laura Vernon Scholarship, the Jumper Award, and the Professor W. Paul Jones Scholarship.

Graduate Study

The department offers work for the Master of Arts degree with a major in English, and minor work for students majoring in other departments. The master's degree requires 30 semester credits, including a thesis (3 credits) or a major project (ordinarily 3 credits). Courses must include 530, 511 or 512, and usually 503. Basic knowledge of one foreign language must be demonstrated by test or coursework. Toward the end of the program, each candidate writes an examination covering a major author and a period or area in literature, linguistics, or other programs offered by the department agreed on by the candidate and the examination committee. Candidates admitted to major graduate work should have completed undergraduate study substantially equivalent to that in the undergraduate program in English, except:

Individual graduate programs of study are designed to prepare students for (1) teaching at the secondary, two-year college, or beginning college and university levels, (2) further graduate study in language and literature, (3) teaching English as a second language, (4) creative writing, (5) technical writing, editing, and associated commercial writing activities.
Courses Primarily for Undergraduate Students

10. Intensive English and Orientation Program (20-50)

Cr 0 Prezar Recommendation of the English Department. Full-time study of English for speakers of other languages. Brochure available from the Office of International Educational Service.

100. English for Native Speakers of Other Languages, Prezar Recommendation of English Department: 100C: 1008 or placement in 100C; 100D: 1008 or placement in 100D. Placement in various sections is determined by English Requrement for International Students in Index.) For undergraduates. Completion of English 100 requirement prepares for English 104. For graduates: Completion of 100 requirement satisfies the English requirement of the Graduate College.

A. Spoken English Cr 2
B. Intermediate-level Grammar Review and Composition Cr 3
C. Advanced-level Composition — Undergraduates Cr 3
D. Advanced-level Composition — Graduates Cr 3
E. Supervised Independent Study Cr 1-2 each time taken

Section 1: Listening Cr 1
Section 2: Vocabulary Cr 1
Section 3: Reading Cr 1

The University does not allow credit in English 100 to count toward graduation. Persons whose native language is English cannot take English 100 for credit.

200. Developmental Reading

200-201 Cr 1 each time taken, maximum of 2. F S S S 8 weeks. Acceptable only for elective credit in sciences and humanities. Training in reading, which includes thorough comprehension, rate, and vocabulary exercises. Offered on a satisfactory-fail basis only. May be repeated only by permission of instructor.

201. Introduction to Literature (3-0) Cr 3 F S S S Prezar Credit or classification in 105. Emphasis on comprehension of literature in their relation to recurrent human problems. Study of selected texts chosen to illustrate different approaches to literature.


205. Propaganda Survey and Analysis (3-0) Cr 3 F S S S Prezar 105. Analysis of how newspapers, books, magazines, radio, television, and film convey facts, beliefs, judgments, and values. Special emphasis on verbal and nonverbal devices employed in the propaganda process. Students may be required to purchase extended periodicals, attend screening films, and view certain television programs. Fee

210. Introduction to Literary Study (3-0) Cr 3 Prezar Credit in or classification in 103. Basic principles of literary study. Emphasis on writing of interpretive and critical essays. Particular attention to poetry. Designed for, but not limited to, English majors.

219. Introduction to English Linguistics (3-0) Cr 3 F S S S Prezar 105. Introduction to the principles of linguistic analysis with English as the primary source of data. Syntax, morphology, vocabulary, and meaning issues in the study of usage, regional and social dialects, and language change.


235. Free Lancers Writing for Magazines (3-0) Cr 3 Prezar 105. Practical workshop in writing non-fiction articles for popular magazines. Emphasis on writing in market research, preparation of manuscript, methods of submission. Major goal of the course is production of marketable material.

301. Creative Writing — Fiction (3-0) Cr 3 Prezar 105. Not open to freshmen. Progresses from practice in basic techniques of fiction writing to fully developed short stories. Emphasis on writing, analytical reading, workshop criticism, and individual conferences.

305. Creative Writing — Poetry (3-0) Cr 3 Prezar 105. Not open to freshmen. Progresses from practice in traditional to modern forms. Emphasis on writing, analytical reading, workshop criticism, and individual conferences.

315. Creative Writing — Screenplays (3-0) Cr 3 each time taken, maximum of 6. Prezar 105. Not open to freshmen. Stresses master scene technique of writing fully developed screenplays. Course may be repeated in conjunction with actual production of film or teleplay

316. Creative Writing — Exposition (3-0) Cr 3 Prezar 105. Emphasis on writing, analytical reading, workshop criticism, and individual conferences.

325. Creative Writing — Playwriting (Sp 316) (3-0) Cr 3 Prezar 105. Not open to freshmen. Progresses from practice in production of scenes to fully developed one-act plays. Emphasis on action, staging, writing, analytical reading, workshop criticism, and individual conferences.

335. Film (3-0) Cr 3 F S S S Prezar 105. Principles of film art and the traditional vocabulary of literature as applied to film. Emphasis on film of modes of thought and behavior.

344. Readings in Biography (3-0) Cr 3 Alt Ye Prezar 105. Junior classification. Uses autobiography and autobiography to distinguish figures in a variety of fields. Study of different approaches to problems of biography and autobiography. Emphasis on the biographer and the biographical subject.

349. Literature by or About Women. (W S 345) (3-0) Cr 3 each time taken, maximum of 6. Prezar 105. Literature by and/or about American women.

352. American Indian Literature. (Am In 349) (3-0) Cr 3 Alt Ye Prezar 105. Survey of literature of the American Indian from pre-Columbian tales and songs to contemporary novels and poetry.

357. Survey of Black American Literature. (3-0) Cr 3 F S S S Prezar 105. Literature by and/or about American black Americans from the beginnings to the 1960s.

359. Selected Topics in Minority Literature. (3-0) Cr 3 each time taken, maximum of 6. Prezar 105. Literature by and/or about American ethnic minorities. May include literature of ethnic groups or focus upon one of the following: Asian Americans, Black Americans, Hispanic Americans, American Indians.

353. World Literature. (3-0) Cr 3 each Ye Prezar 105. Ancient classics (Greek and Roman) to the Renaissance. European masterpieces from the Neoclassical Age to the twentieth century.

363. The Bible as Literature. (3-0) Cr 3 Prezar 105. Survey of literature from the Bible, with special emphasis on Apocrypha including narrative, poetry, wisdom literature, and apocalyptic literature.

375. Folk Literature and Myth. (3-0) Cr 3 Alt Ye Prezar 105. Folk literature, its types and functions, in both sacred and secular traditions. Emphasis on traditional narratives (epic, legend, ballad, folk and fairy tales), myth, proverbs, and riddles.

380. American Literature from its Beginning through India. (3-0) Cr 3 Prezar 105. American literature from its Puritan beginnings through the colonial period to early romanticism. Literary works and their social and cultural contexts.

381. The Romantic Era in American Literature (1820-1869). (3-0) Cr 3 F S S S Prezar 105. American literature through the romantic era as it achieved international significance in the 1850's, literary works and the social and cultural contexts.

385. The Realism and Naturalism in American Literature (1850-1914). (3-0) Cr 3 F S S S Prezar 105. Realism and naturalism in American literature to the beginning of World War I, literary works and their social and cultural contexts. Dickinson, Twain, James, Crane, Robine.


395. English Literature of the Middle Ages. (3-0) Cr 3 Prezar 105. Introduction to medieval literature, England to the Renaissance, considered in the social and intellectual context of the period.

397. English Literature of the Renaissance. (3-0) Cr 3 Prezar 105. Introduction to Renaissance literature. (More to Milton), considered in the social and intellectual context of the period.

398. English Literature of the Restoration and Eighteenth Century. (3-0) Cr 3 Prezar 105. Introduction to Restoration literature and eighteenth-century literature (Dryden to Johnson), considered in the social and intellectual context of the period.

399. English Literature of the Romantic Period. (3-0) Cr 3 Prezar 105. Introduction to Romantic literature. Blake to Byron, considered in the social and intellectual context of the period.

400. English Literature of the Nineteenth Century. (3-0) Cr 3 Prezar 105. Introduction to nineteenth-century American literature. (Browning to Melville), considered in the social and intellectual context of the period.

402. English Literature of the Modern Period. (3-0) Cr 3 Prezar 105. Introduction to British literature of the twentieth century (Conrad to Auden), considered in the social and intellectual context of the period.


408. Modern Poetry. (3-0) Cr 3 Prezar 105. A cross-cultural reading in the major poets of this century: Yeats, Frost, Rilke, Eliot, and others.

410. Contemporary Literature. (3-0) Cr 3 Prezar 105. Studies in fiction, poetry, or drama of the last two decades: Emerging trends and techniques; intellectual concerns.

411. The English Novel to 1800. (3-0) Cr 3 each Alt Ye Prezar 105. The English novel to 1800. Considered in the social and intellectual context of the period.

412. The English Novel to 1800. (3-0) Cr 3 each Alt Ye Prezar 105. The English novel to 1800. Considered in the social and intellectual context of the period.
Entomology

Paul A. Dahm, Chair of Department

Professors: Dahm, DeWitt, Guthrie, R. E. Lewis, Mulchmor, Pedigo, Rowley, Stockdale

Emeritus Professor: Bnndley

Associate Professors: Foster, Hart, Jarvis, Krafur, L. C. Lewis, Showers, Tolleson

Assistant Professors: Coats, D. R Lewis, Queenberry, Mertins

Adjunct Instructors: L. A. Buntin, Trump

Undergraduate Study

For undergraduate curriculum in entomology, see College of Agriculture, Curricula

The undergraduate curriculum in entomology is designed for persons interested in studying insects, the ways in which they live, and the practicalities of dealing with them. Students electing entomology as a major will prepare themselves for positions in industry, business, government, education, and public health. Graduates may acquire positions in research, development, and technical sales for agricultural and chemical companies. State and federal agencies employ entomologists as consultants, extension directors, mosquito abatement agents, inspectors, and research aides. Entomologists may also find employment as consultants with pest-management consulting firms, large private farms and ranches, and horticultural nurseries.

Students who are planning to enter agricultural occupations dealing with insect control are advised also to elect the pest-management secondary major. Pest management is an undergraduate secondary major that can be taken with entomology in a double-major program (see Pest Management).

A prevetnary program is available in entomology.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with major in entomology. Within the major, the student may specialize in behavior, biological control, ecology, economic entomology, host plant resistance, medical entomology, morphology, pathology, pest management, physiology, systematics, or insecticide toxicology. Prerequisite to major and minor graduate work in the department is completion of at least two years of zoological courses, for part of which credit in other closely allied biological sciences may be substituted. Specific course requirements for advanced degrees depend partly upon previous training and experience in the major field of specialization.

Any student receiving a graduate degree in entomology shall have one course in at least three of the following areas for the M.S. degree and one course in each of the following areas for the Ph.D. degree: insect morphology, systematic entomology, insect physiology, and insect ecology. Equivalents of these courses taken at other universities will be acceptable.

The Federal Corn Insect Research Unit at Ankeny is available for advanced study in certain phases of entomological research. The department participates in the interdepartmental programs of Immunobiology and Molecula, Cellular and Developmental Biology (see Index).

Open to graduate students for minor credit only 370, 376

Courses Primarily for Undergraduate Students

110 Technical Lecture (1-0) Cr. R. F. Orientation to areas of and opportunities in entomology

111 Insects and Man—Biological Considerations (3-0) Cr. 3 S Mertins Biological and ecological aspects of the insect world; beneficial and harmful insects. Impact of chemicals and alternative control methods. Voluntary field trips. Primarily for non-life-science majors.

222 Beekeeping (2-6) Cr. 2. First 8 weeks. S, last 8 weeks. Trump: Natural behavior of bees as related to honey production and crop pollination. Practical experience in managing colonies and storing honey.


374 Medical and Veterinary Entomology (3-0) Cr. 3 S Prereq: Zoology 370. Davids. Biology and ecology of insects that affect the health of people and animals, including the history of human disease caused by insects. Voluntary field trips.

490 Independent Study. Cr. 1 to 3 each time taken Prereq: 15 credits in zoological sciences and permission of instructor.

U Laboratory teaching experience. For students regrettling to be undergraduate laboratory assistants

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Seminar. Cr. 1 F S Prereq: Permission of instructor. Reports of research and current literature.

544 Advanced Forest Pest Management. (PP SW 544) See Plant Pathology, Seed and Weed Sciences.

570 Host Plant Resistance to Insects (2-0) Cr. 2 Alt S. offered 1983, Prereq: Zoology 110. Tolleson Principles and mechanisms of insect control by host plant resistance.


572 Economic Entomology (2-6) Cr. 4 F Prereq: Zoology 370. Tolleson. Contemporary concepts of insect biology and insect population management.

574 Medical Entomology (2-6) Cr. 4 F Prereq: 9 credits in biological sciences. Davids, Tolleson. Anatomical and pathological significance of insects and other arthropods that attack people and animals, particularly those that are vectors of disease. Field trips.

575 Biological Control (3-0) or (3-3) Cr. 4 Alt S. offered 1983, Prereq: Zoology 110. Theory and practice of biological control of insects and other pests. Biology and behavior of entomopathogenic insects, entomogenous nematodes and pathogenic microorganisms. Review and critique of important world projects.

576 Systematic Entomology (3-6) Cr. 5 S Prereq: 370 Classification, distribution and natural history of insects including fundamentals of nomenclature and taxonomic principles. Field trips when practical.

577 Immature Insects (2-6) Cr. 4 Alt S. offered 1982, Prereq: 576 Lewis. Taxonomy, distribution and natural history of immature insects including techniques of collection and preservation. Field trips when practical.

590 Special Topics. Cr. 1 to 3 each time taken Prereq: 15 credits in zoological sciences, permission of instructor.

E Special research topics: Internship experience in the techniques of organizing and disseminating applied entomological information.

U Teaching experience

Courses for Graduate Students, major or minor


Environmental Studies

(Interdepartmental Undergraduate Program)

Craig B. Davis Coordinator

Professors: Gratto. Hodges, O'Toole, Sinatra

Associate Professors: Hollembach, Rosauer, Tanner

Assistant Professor: Richardson

The Environmental Studies Program is designed for students interested in improving their understanding of environmental problems and the various factors influencing the development and solution of these problems, or for students desiring careers in environmental science, environmental technology, environmental planning and management, environmental assessment, or environmental education. The program is designed to give the student an appreciation of the environment and an overview of environmental problems and their solutions. The overall structure and philosophy of the program are designed to provide an atmosphere in which interdisciplinary breadth may be combined with disciplinary depth in the quest for solutions to environmental problems.

The program has two facets: a required core and a student-designed area of emphasis (AOE). The core incorporates 11 credit hours of course work and is designed to acquaint students with the intricate, interdisciplinary nature of environmental problems (Env 221, 222, 391, 421). The area of emphasis consists of 20 credit hours of course work and is designed to allow students to individualize programs to
suit particular desires and goals. Courses for the AOE are selected from disciplinary courses taught by various departments on campus.

Research and independent study activity are encouraged. Students may include up to 4 hours of 290E or 490E in their AOE's. These activities may involve internship experiences when approved in advance by the coordinator of environmental studies.

The combined core and area of emphasis must include a minimum of 20 credits of courses numbered 300 or above.

Students in any college of the University may enroll in the Environmental Studies Program by registering with the coordinator of the program and developing an appropriate area of emphasis. Completion of the program is recognized by a statement to that effect which is entered on the student's transcript.

Students in the College of Education and the College of Sciences and Humanities may enroll in environmental studies as a second major (See Education and Sciences and Humanities Cross Disciplinary Studies.)

Open to graduate students for minor credit only. 421, 425

Courses Primarily for Undergraduate Students

221. Introduction to Environmental Studies. (U) 221 (3-0) Cr. F. Prereq: Sophomore classification. The structure and dynamics of environmental systems, social and ecological basic ecology, the role of information, material resource availability and use, energy resource availability and use, and pollution of air, water and land.

222. Introduction to Environmental Studies. (U) 222 (3-0) Cr 3 S. Prereq: Sophomore classification. Human population growth, the world food problem, production and consumption patterns in ecosystems and social systems, cultural approaches to the environment, and the growth vs. no growth controversy. Emphasis on factors affecting decision-making.

225. Introduction to Environmental Education. (U) 225 (2-0) Cr 3 F. Prerequisites: Goals, issues, and instructional materials in environmental education. Field experience with teachers and children. Environmental education as a multidisciplinary endeavor. Environmental education in non-school agencies. Contemporary environmental education compared with outdoor education, nature study, and conservation education.

390E. Special Problems. (U) 390E (1-0) Cr 1 F. Prereq: Permission of the Coordinator of the Environmental Studies Program and the Vice President for Academic Affairs. Independent study on topics of an interdisciplinary nature. Intended primarily for freshmen and sophomores.

391. Seminar in Environmental Studies. (U) 391 (1-0) Cr 1 F. Prereq: Junior classification. Seminar discussions of various topics of environmental concern.


425. Environment and Society. (U) 425 (3-0) Cr. 3 S. Prereq: 10 hours in social or natural sciences. An in-depth analysis of natural and human-modified ecosystems with attention on energy, resources, food, and population and their relation to society and the quality of human environments.

490E. Independent Study. (U) 490E (3-0) Cr. An Prereq: Permission of the Coordinator of the Environmental Studies Program and the Vice President for Academic Affairs. Independent study on topics of an interdisciplinary nature. Intended primarily for juniors and seniors.

Family Environment

Edward A. Powers, Chair of Department

Professors: Bivens, Deacon, Hetslley, Peet, Pickett, Powers, Schwier

Emeritus Professors: Budoffcon, Liston

Associate Professors: Cole, Jerles, Meredith, Morris, Rippee, Strong, Welthm, Winter

Assistant Professors: Allen, Bishop, Denzin, Hira, Jones, Mercer, Norem, Wedin, Yerms

Instructors: Enders, Hullman, Needles-Fletcher

Undergraduate Study

For undergraduate curriculum in family environment leading to the degree of bachelor of science, see Home Economics, Curriculum.

The Department of Family Environment offers courses that explore in ways which families and individuals develop and allocate human and material resources to achieve individual and family goals. The department offers work for the degree Bachelor of Science with curricula in family resource management, family services, and housing and the near environment.

The family resource management curriculum focuses on the behavior of families as they allocate and manage their resources and function as consumers. The curriculum leads to employment with agencies and organizations that are concerned with family financial management, consumer economics, and analysis and implementation of public policies that affect family resource management.

The family services curriculum leads to work in the helping services. Employment opportunities exist in public and private agencies. Examples include services to the elderly, youth services, community action, community planning, rehabilitation, health care, family services, and crisis intervention.

The curriculum in housing and the near environment includes emphasis in home furnishings, housing, and household equipment. Graduates of this curriculum find employment with business and industry, private agencies, and federal, state, and local governments.

Graduate Study

The department offers the degrees of Master of Science with a major in family environment, and the Ph.D. degree as a joint major with another field such as chemistry, child development, economics, education, food and nutrition, home economics education, physics, sociology, and anthropology. A family environment minor is available for Ph.D. students majoring in other departments.

The department cooperates in the interdepartmental programs of Housing, Gerontology, Technology and Social Change, and Water Resources (see index).

Prerequisite to major work in family environment is the completion of at least 10 credits in each of the following areas: communicative arts, humanities, physical and biological sciences, and social and behavioral sciences. The student should also have the equivalent of the courses generally considered as introductory principles in the family environment program at this institution. Educational background in the physical and/or social sciences may be suitable, depending on the student's objectives.

Guidelines for graduate programs of study in family environment have been developed. However, the student's program of study committee has the major responsibility for determining requirements for an individual program.

Open to graduate students for minor graduate credit only. 408, 410, 412, 445, 446, 471, 479, 488.

Courses Primarily for Undergraduate Students

185. Families and Their Environment. (3-0) Cr. 3 F. Exploration of the interaction of families with the social, economic, physical, and political dimensions of the environment over time.

201. Family Life Development. (C,D) 201 (3-0) Cr 3 F. SS. A study of the dynamic processes of co-development of families and individuals, both normal and exceptional. Patterns of self-development and life-span development with focus on the interaction between and among individuals.

240. Introductory to Housing. (2-1) Cr. 3 F. Prereq: 240. SS. A study of housing. Criteria for judging interior living spaces to meet needs of individuals and families. Emphasis on light for general, task, and aesthetic effects. Light sources, wiring, and techniques to implement design objectives and conserve energy.

311. Housing Finance. (3-0) Cr. 3 F. Prereq: 240. Econ 201. Personal and family financial consideration in home ownership, rental, and home improvement. The social, economic, and governmental context of finance decision making at the household level.

354. Equipment in the Home. (3-0) Cr. 3 F. Prereq: Junior classification or 3 credits in physics. Utilization of water, electricity, gas, light, and heat for doing work and maintaining health and comfort in the home. Environment and Selection and use of portable and major appliances as related to consumer needs, interests, and resources. Application of basic and physical science principles.

360. Rehabilitation Principles and Services. (2-0) Cr. 2 F. Prereq: 6 credits in family environment, sociology, or psychology. Principles related to physical, social, psychological, economic, and intellectual limitations of individuals with disabilities. Roles of family as support system. Programs and activities designed to assist disabled in home and community.

370. Personal and Professional Communication. (3-0) Cr. 3 F. Prereq: Junior classification. An analysis of functional communication patterns with a professional orientation toward understanding and implementing communication skills in interpersonal, family and professional relationships.

370L. Laboratory in Communication Skill Development. (2-0) Cr 1 F. Prereq: Classification in 370.

373. Death as a Part of Living. (2-0) Cr. 2 F. Prereq: 201 Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and social attitudes. Field trip. Fee.

377. Aging and the Family. (2-0) Cr. 2 F. Prereq: 201. Interchanges of the aged and their families. Emphasis on role changes, social interaction, and independence as influenced by the family, their environment, life styles, and community development.

378. Family and Management Patterns. (2-1) Cr. 3 F. Prereq: 201. Soc. 134, Econ 201. The use of family and management theory in understanding family behavior and patterns.

380. Family Law. (3-0) Cr. 3 S. Prereq: Junior classification. Family relationships, rights, and duties as prescribed by law. Investigation of sources and interpretations of law.

391. Family and Community Assessment. (3-0) Cr. 3 F. First 8 weeks. Prereq: 370, 6 credits in sociology, psychology, or family environment; junior classification. Prepracticum training for methods of data gathering and skills needed to function as professionals. Development of case studies, interpretation of census data findings, identification of key community leaders, agencies, or business contacts or other needs contributing to family and community needs assessment.
knowledge of nutrition for the betterment of their health. It meets academic requirements for admission to dietetic internships offering specialization in community nutrition.

The curriculum in dietetics offers two options planned for students interested in medical dietetics, food service, and nutrition education. Graduates are prepared for a wide variety of positions in hospitals, clinics, nursing homes, and government nutrition programs. They may work as private nutrition consultants in cooperation with physicians or as nutritionists with food industries. This curriculum meets the academic requirements for membership in the American Dietetic Association; option II (coordinated undergraduate program) also meets the experience requirements for ADA membership.

The curriculum in food science offers two options which differ in emphasis. Option I (consumer food science) serves those who are interested in preparation of food and in food-product development in experimental kitchens or laboratories. It prepares students for careers in food research, food-product development, food-promotion programs, and consumer services in government, business, and industry. Option II (food science) provides a strong background for research positions in colleges and universities, government agencies, foundations, and food industries. It is particularly good preparation for graduate study.

The curriculum in nutritional science offers students excellent preparation for research positions in laboratories of colleges and universities, government agencies, industries, and foundations. It also offers students especially strong background for graduate study.

Graduate Study

The department offers work for the degree of Master of Science with majors in food science, nutrition, and food and nutrition, and for the degree of Doctor of Philosophy with majors in food science and nutrition, and minor work for students taking major work in other departments.

Prerequisite to major work is the completion of a curriculum in food and nutrition substantially equivalent to that required of undergraduates at Iowa State University. Students with undergraduate majors in biological and physical sciences also are qualified for graduate study in food science and nutrition.

Students taking major work for the degree of Doctor of Philosophy either in food science or in nutrition may choose minors from other fields of home economics as well as from anthropology, chemistry, biochemistry, bacteriology, economics, education, food technology, journalism, psychology, physiology, sociology, statistics, or other related fields.

For the degree Doctor of Philosophy, there is a requirement for (1) construction of a satisfactory reading knowledge of two foreign languages or (2) competence in communication in one foreign language as demonstrated by examination or as indicated by two years of course work (C grade or better) in the baccalaureate program. The program of study must demonstrate proficiency at a high level of competence in a subject matter area of skill outside the major or minor (such as DVM or MD degree, certification in a technical specialty, skill in an advanced instrumental or computational technology) for the foreign language requirement. The substitution must contribute to doctoral performance and must be approved by the departmental executive officer.

Open to graduate students for minor credit only: 305, 410, 413, 414, 431.

Courses Primarily for Undergraduate Students

107. Human Nutrition. (3-0) Cr. PreReq: Bio 105 or 110 or 131.
226. Food and Nutrition 1. (2-2) Cr. 
258. Microbiology of the Human Body. (2-0) Cr.
304. Nutrition in Dietetics. (3-0) Cr. PreReq: An introduction to the coordinated undergraduate program in dietetics. Introduction to the roles of dietitian and the health care delivery system.
404. Seminar in Food and Nutrition. (1-0) Cr. PreReq: Food 301.

411. Experimental Study of Food. (2-3) Cr. PreReq: 214; 3 credits in biochemistry, senior classification. Application of scientific principles to the solution of problems in food preparation. Not to be taken by majors in food science or students desiring to take 421 and 422.

413. Community Nutrition. (2-3) Cr. PreReq: 305 Survey of current public health nutrition problems among nationally varied individual and groups. Discussion of the multidimensional nature of those problems and of community programs designed to help solve them and the role of community nutritionists. Concurrent field observation and laboratory work.

414. Program Development in Community Nutrition. (2-3) Cr. PreReq: 413 Identification of problems, introduction to planning and evaluation of programs designed and conducted with faculty guidance.

418. Nutrition Education Methods. (1-2) Cr. PreReq: Credit or classification in 431, Sp 211 or 212 Methods of group and individual nutrition education. As they apply to health care clients, employees, and allied health professionals. Discussion and application of needs assessment techniques, instructional development, documentation techniques, and teaching methods.

421. Experimental Approach in Food Science. (2-4) Cr. PreReq: 302, 300, 311; 3 credits in biochemistry. Experimental approach to the study of factors influencing behavior of foods.

422. Food Product Development. (2-6) Cr. Prerequisite: completion of 415 and concurrent examination of the degree impact on behavior of foods. Identification of problems influencing behavior of foods, guidance and individual experience in planning, executing, and reporting a problem in food research, interpretation and evaluation of pertinent literature.

426. Multicultural Food Patterns of Families. (2-3) Cr. PreReq: 421, permission of instructor. Study and preparation of the food and beverage common to and characterizing family foods in other countries.

430. Supervised Hospital Experience. Cr. 1 or 2 SS Pre Req: Senior classification in food and nutrition, advance approval by the departmental executive officer. Supervised experience in a hospital dietary department.

431. Nutrition in Disease. (3 or 4-0) Cr. PreReq: 305. Pathophysiology of selected medical problems with specific attention to nutritional needs and treatment as part of medical therapy.

440. Experience in Clinical Dietetics. (2-6) Cr. PreReq: Classification in 418 and 431, admission to the coordinated undergraduate program in dietetics. Supervised experience in clinical dietetics. Includes laboratory and nutrition care plan development, documentation, counseling, and teaching. Coordinated with 418 and 431.


442. Medical Dietetics. (3-9) Cr. PreReq: Concurrent enrollment in 441. Biological basis of medical therapy, and diet therapy for selected pathologies. Consideration of factors in planning and conducting nutritional care of patients. Integration of principles with clinical experience.

444. Dietetic Seminar — CUP. (1-0) Cr. PreReq: 440, 441, 442. Seminar in dietetics covering the dietetic profession as observed in clinical settings and in the literature.

445. Experience in Community Dietetics. (2-6) Cr. PreReq: Classification in 410 and 413, admission to the coordinated undergraduate program in dietetics. Supervised experience in planning and providing nutritional care for individuals and groups in a variety of community settings. Coordinated with 410 and 413.

490. Independent Study. Cr. 1 or 3-0 Cr. PreReq: permission of the departmental executive officer and instructor.

A. Nutrition
B. Food Science
C. Coordinated undergraduate program in dietetics
H. Honors

499. Research. Cr. 1 or 6-0 Cr. PreReq: permission of instructor. Individual study of methods used in nutrition and food science research with application to selected problems.

*Credit for both 207 and 208 may not be applied toward graduation.
Courses for Graduate Students, major or minor
601 Advanced Nutrition. (4-0) Cr 4 S Prereq 305. B
400 and 410 or B B 405. Acceptance of human nutrition includes energy, body structure, function, nutritional interrelationships, nutrient requirements, status and assessment, and availability. Nutritional status and nutritional diseases, socio-cultural influences on nutrition.
602 Chemical Methods for Research in Food and Nutrition. (1-0) Cr 3 F Prereq 305. Chem 211 or equivalent. Application of chemical techniques to research in nutrition and food science.
607 Animal Experimentation in Nutrition Research. (1-0) or 6 Cr 1 or 3 S Prereq 606 or 305 and Chem 211. The animal feeding experiment as a technique in nutrition research; Principles and basic experimental design using small laboratory animals. Individual problems in the laboratory animal.
609 Seminar. (1-0) Cr 1 F Prereq Required of all graduate majors in the Food and Nutrition Department.
612 Food Lipids. (F Tch 612) (2-0) Cr 2. Alt S. offered 1962. Prereq 612 or F Tch 411 or B B 404. Structure and analysis of foods lipids, glyceroles, structure, crystal form and texture, autoxidation, refining and processing of fats and oils.
613 Food Proteins. (F Tch 613) (2-0) Cr 2. Alt F. offered 1961. Prereq 612 or F Tch 411 or B B 404. Properties of proteins found in milk, eggs, meat, and cereals. Effect of processing on food proteins.
614 Carbohydrates in Foods (F Tch 614) (3-0) Cr 3 Alt S. offered 1964. Prereq 413 or F Tch 411 or B B 404. Study of production of carbohydrates used in foods, changes they undergo during processing and storage of food, and relation of their functions to their chemical and physical properties.
615 Selected Topics in Nutrition (2-0) Cr 2 each time selected F Prereq 601. Sense of one-term courses on such topics as protein, vitamins, minerals, foods, energy metabolism, and role of nutritional status. Classical and current research literature in each area.
630 Nutritional Pharmacology and Toxicology. (3-0) Cr 3 F Prereq 601. Mechanistic and biometric concepts, nutrient toxicology, action of nutritional status. Classical and current research literature.
699 Research
A. Nutrition
B. Food Science

Food Technology
W. W. Manion, Head of Department

Professors: Hammond, Hartman, Kline, Kratt, LaGrange, Parmish, Robson, Rust, Stroemer, Walker

Associate Professors: Glantz, Haskai, Olson, Sebrenek, Wilson

Assistant Professors: Hsu, Love, Murphy

Undergraduate Study
For undergraduate curriculum in Food Technology, see College of Agriculture, Curriculum.

Food technology is a curriculum administered by the College of Agriculture. It consists of the application of the sciences to the development, manufacture, marketing, and protection of food products. The many facets of food technology, such as research, processing, packaging, quality control, marketing, foreign trade, and governmental supervision, create a variety of interesting career opportunities. The curriculum is constructed according to the recommendations of professional societies. Sufficient electives are included so that a student, after taking a core of basic food technology courses, may minor or specialize in those fields of the food industry that are most attractive.

Preparatory preparation is available through food technology.

Students who wish to combine education in engineering with food technology may arrange special five-year programs.

Graduate Study
The department offers work for the degrees of Master of Science and Doctor of Philosophy with major in food technology, and minor work for students majoring in other departments.

Graduate work in most fields is offered as a co-major in animal science and food technology.

The department also participates in the interdepartmental programs of Molecular, Cellular, and Developmental Biology, and Water Resources. (See Index.)

Prerequisite to major graduate work is the satisfactory completion of an undergraduate curriculum essentially equivalent to the food technology curriculum offered in this department or the completion of a curriculum in a related science such as dairy technology, bacteriology, chemistry, biochemistry, or engineering.

Preparation in biology, chemistry, physics, and calculus along with knowledge of food processing, sanitation, and preservation are particularly desirable for those intending to pursue graduate work.

Courses open to graduate students for minor credit only:

Several courses are available for credit with approval of the instructor.

Courses open to graduate students for minor credit only.

Courses are available for credit with approval of the instructor.

Courses for undergraduate students, major or minor, open to qualified undergraduates.

Courses for graduate students, major or minor.

Courses for undergraduate students, major or minor.

Courses for graduate students, major or minor.

Courses for undergraduate students, major or minor.

B. Food Science

Courses for undergraduate students, major or minor.
Courses for Graduate Students, major or minor
614. Carbohydrates in Foods. (F N 614). (3-0) Cr. 3. Alt. S., offered 1983. Prereq: 411 or B B 404 or F N 421. Study of production of carbohydrates used in foods, changes they undergo during processing and storage of food, and physical properties.
628. Advanced Food Microbiology. (Micro 628). (1-0) to 3-0 Cr. 1-3 Alt. S. offered 1982. Prereq. Micro 420 Topics of current interest in food microbiology, including new food-borne pathogens, rapid identification methods, effect of food properties and preservation techniques on microbial growth.
660. Seminar. (1-0) Cr. 1 F S SS.
690. Special Problems. Cr. arr F S SS. Prereq. A major or minor in food technology.
699. Research.

Foreign Languages and Literatures
Orin Frink, Chair of Department

Professors: Bernard, Bruner, Courteau, Dow, Frink, Graupera, Jurdith Lacasa, McVicker, Morris.

Emeritus Professor: Schwartz

Associate Professors: Kahn, Jaime Lacasa, Nabrotzky, Thogmartin, Vinograde, von Wittich

Assistant Professors: Chatfield, Dyl, Johnson, Ruebel, Smith, Valdes, Van Iten.

Courses offered by the Department of Foreign Languages and Literatures are designed to give students a knowledge of the fundamentals of the language and of the culture and the literature of the people whose language is being studied. Foreign language study is valuable for scientific uses and for better understanding of one's own language. Furthermore, it may increase one's employment opportunities. The study of a foreign language, ranging from an introductory sequence through a major concentration to a major emphasis, should be a part of the programs of most students.

The department offers majors in French, German, Russian, and Spanish, leading to the degree bachelor of arts, as well as instruction in Greek, Italian, Latin, and Portuguese. For a complete statement of all the college degree requirements, see Sciences and Humanities, Curriculum.

Students who have had foreign language training in high school in a language offered at Iowa State may obtain credit by passing appropriate examinations. Native speakers of the foreign languages may take literature and civilization courses in their languages at the 300 level or above, or may obtain credit by passing appropriate examinations at that level. Students should consult with the department to determine eligibility for test-out or taking courses.

The Department of Foreign Languages and Literatures participates in the Iowa Board of Regents' foreign language summer programs in Austria, France, and Spain. Information concerning these programs can be obtained directly from the department.

Language and literature courses numbered 300 and above are principally taught in the language, except that courses numbered in the 370's are taught in English translation.

Courses open for minor grade credit. French 401, 402, 441, 442, 443, 444, 448, 490, Ger 401, 402, 441, 442, 443, 444, 448, 490, F 401, 402, 441, 442, 443, 444, 448, 490, Span 401, 402, 451, 452, 454, 455, 480, 490, 497

Courses Primarily for Undergraduate Students

French (French)

Majors in French are required to complete a minimum of 32 credits beyond the intermediate (201, 202) level. They must complete French 242 and the following sequences: 301, 302, 321, 322, 331, 332, and either 401, 402, or 403. From the Romance linguistics sequence: 491, 492. In addition, they are required to take two 400 level literature courses.

Majors in French must pass an examination of oral and written proficiency in the language. This examination should be attempted during the junior year. The French staff will direct remedial work for those who do not pass the examination.


104. French for Travelers. (2-1) Cr. 2 S. A practical course in spoken French for people who plan to travel in France or French-speaking countries. Basic grammar and expressions needed to deal with everyday situations. Practicing in simple French for one semester.


German (Ger)

Majors in German are required to complete 27 credits beyond the intermediate (201, 202) level. Qualifying sequence is 301, 302, 303, 304, and 402 may be based on 3 years of German in high school, or study abroad, or both.

101, 102. Elementary German. (4-1) Cr. each 4 each. F S S SS. Prereq. 102. F S S SS. Prereq. 101. Introduction to German language within the context of German culture, politics, and literature


301, 302. Composition and Conversation. (3-0) Cr. each 3 each. Prereq. 301 F S S SS. 302. Prereq. 301 F S S SS. 302. Thorough study of the German language with emphasis on improving writing and speaking skills.
German Literature in English Translation. (3-0) Cr
3 5 Introduce students to German thought and culture through readings, lectures, and discussions in English of selected German authors.

401, 402. Advanced Composition and Conversational. (3-0) Cr each 3 each 401, F, 402: S Prereq 401 302, 402 301. Study of structures of expression, intensive practice in composition and conversation based on selected readings.

420 Topics in German Literature. (3-0) Cr Credit 3 F Prereq 322. Studies in periods, genres, or individual authors. May be repeated for different offerings to a maximum of 6 credits.

411 Enlightenment - Storm and Stress (3-0) Cr 3 Alt F offered 1982 Prereq 302 or 322 Readings in German literature of the Enlightenment and Storm and Stress periods.

422 Classics - Romanticism. (3-0) Cr 3 Alt F, offered 1983 Prereq 302 or 322 Readings in German literature of the Classical and Romantic periods (to 1830).

442. Nineteenth Century German Literature. (3-0) Cr 3 Alt F offered 1981 Prereq 302 or 322 Readings in German literature from 1830 to 1914.

444. Twentieth Century German Literature. (3-0) Cr 3 Alt S offered 1982 Prereq 302 or 322 Readings in German literature from 1914 to the present.

450 Independent Study. Cr 1-6 each time taken. Prereq Permission of department head. Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields.

Classical Greek (G Krk)
101, 102. Elementary Greek. (4-1) Cr 4 each Alt Yr, offered 1981-1982. Prereq 301 Grammar and vocabulary of ancient Attic Greek, within the context of Greek culture. Reading knowledge through texts adapted from classical authors.


490 Independent Study. Cr 1-6 each time taken. Prereq Permission of department head. Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields.

Italian (Itt)
101, 102. Elementary Italian. (4-1) Cr 4 each Yr Prereq 102 101. Introduction to basic grammar and structure of the language, use of the language laboratory supplemented by graded readings within the context of Italian culture. Especially recommended as a second area of language study for majors in French and Spanish.

201, 202. Intermediate Italian. (4-1) Cr 4 each Alt Yr, offered 1981-1982. Prereq 201 102, 202 201. Review of first-year principles and expanded study of grammar, development of written and spoken skills, introduction to the culture and civilization through extracts from noted authors.

490 Independent Study. Cr 1-6 each time taken. Prereq Permission of department head. Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields.

Latin (Lin)
101, 102. Elementary Latin. (4-1) Cr 4 each Yr Prereq 102 101. Grammar and vocabulary of classical Latin, within the context of Roman culture, reading knowledge through texts adapted from classical authors.

201, 202. Intermediate Latin. (4-1) Cr 4 F Prereq 202 Review of grammatical principles, emphasis on reading unadapted texts from the late Republic or Early Empire.

242. Introduction to Latin Literature. (4-0) Cr S Prereq 201. Masterworks of Latin prose or poetry with emphasis on techniques of literary and historical critical.

341, 342. Advanced Readings in Latin. (3-0) Cr 3 each 341, F 342 S Prereq 242 Study of individual authors or genres, intensive readings in the original supplemented by modern criticism and analysis in English. Authors and genres will vary. Courses may be repeated to a maximum of 6 credits each.

490 Independent Study. Cr 1-6 each time taken. Prereq Permission of department head. Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields.

Portuguese (Por)

321, 322. Luso-Brazilian Civilization and Culture. (4-0) Cr 4 each Alt Yr, offered 1982-1983. Prereq 301 321 322. 321 An introduction to Luso-Brazilian civilization and culture through consideration of significant literary, historical, and social figures. 322 Advanced study of Luso-Brazilian civilization and culture.

490 Independent Study. Cr 1-6 each time taken. Prereq Permission of department head. Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields.

Russian (Rus)
In majors in Russian are required to complete 24 credits beyond the intermediate (201, 202) level, including 301, 302, 321, 322, 401, 402, 441, 442.


301, 302. Composition and Conversation. (3-0) Cr 3 each 301 F, 302 S Prereq 301 302 301. Review of grammar. Continued work on reading, writing, understanding, and speaking the language.

321, 322. Russian Civilization. (3-0) Cr 3 each Alt Yr, offered 1982-83. 321 F 322 S Prereq 321 322 321. Topics selected from the history, art, architecture, music, and geography of Russia.


441, 442. Literary Masterpieces of the Nineteenth and Twentieth Centuries. (3-0) Cr 3 each Alt Yr, offered 1981-82. Prereq 301 or 302 301 Readings, discussions, and compositions of major works of Russian literature.

490 Independent Study. Cr 1-6 each time taken. Prereq Permission of department head. Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields.

Spanish (Spa)
In majors in Spanish are required to complete a minimum of 30 credits in courses numbered 301 and above. These courses must include 301, 302, 321, 322, 401, 402, and 12 credits in 400-level literature courses.

101, 102. Elementary Spanish. (4-1) Cr 4 each Alt 101 F, S SIS 102 S Prereq 101. 102. 102. 102. Essential of construction and vocabulary with an aural-oral approach and use of the language laboratory, within the context of Hispanic culture.

Forestry

George W. Thomson, Chair of Department

Professors: Countryman, Hinz, Hopkins, Mann, McNabb, Prestemon, Scholtes, Thomson

Emeritus Professors: Bensend, Kellogg

Associate Professors: Hall, Schultz, Way

Assistant Professors: Collitti, Jungst, Kuo, Mize

Undergraduate Study

The department offers work for the degree Bachelor of Science with a major in forestry and options in forest resource management, forest products, and forest recreation. Minor elective courses can be chosen to emphasize administration and management, quantitative-analytical techniques or biological-physical relationships as they apply to the management of forest resources, forest recreation resources, or wood products production and marketing.

Many private firms as well as federal, state, and local agencies seek forestry graduates to fill positions in management of natural resources for recreation, timber, water, and wildlife. The wood processing industries (such as pulp and paper, plywood, particle board, lumber, and others) offer professional opportunities in production, product development, quality control, and marketing.

With appropriate graduate study, the range of opportunities is expanded to include research and education as well as more specialized administrative positions.

A 6-week summer field-studies program is prerequisite to admission to junior year forestry courses for students enrolled in forestry. Most students should complete this requirement between their freshman and sophomore years. Transfer students should check with the department for counselor on timing their completion of the field-studies program.

The department participates in interdisciplinary programs in Pest Management and International Studies (see below). By proper selection of electives and minor courses, forestry students can obtain a second major in these programs or in other disciplines.

Graduate Study

The department offers work for the degree Master of Science and Doctor of Philosophy with a major in forestry and minor work to students taking major work in other departments. Areas of specialization for the M.S. degree are: forest administration and management, forest biology, forest biometry, forest economics and marketing, and wood science. Areas of specialization for the Ph.D. are: forest resource science, forest biometry, and forest economics. This graduate program is open to and suitable for students who have majored in forestry or related natural resource fields. A nornthesis master's option is available. All students are required to teach and conduct research as part of their training for the Ph.D. degree.

The department also participates in the interdepartmental program on Water Resources (See Index.)

Open to graduate students for minor credit only:

Courses Primarily for Undergraduate Students


101L. Introductory Laboratory in Forestry Practice. (0-2) Cr. 1 S. Laboratory and field exposure to concepts and techniques for managing forests and other natural resources for multiple uses. Term paper required. Primarily designed for forestry majors.

110. Orientation in Forestry. (1-0) Cr. 0.5 F. Orientation to the academic process as preparation for professional careers in forestry. Career opportunities.


202. Wood Utilization. Cr. 2. Summer Field Studies. Timber products industries of an important forest area, techniques and problems encountered in harvesting and processing wood products; field study of efficient use of timber. Fire.


204. Multiple Use Operations. Cr. 1. Summer Field Studies. Field study of forest resource problems and management programs of user groups: forest industries, special interest groups, resource agencies, and local communities. Examination of conflicts, issues, and potential solutions. Fire.

241. Forest Resource Measurements. (2-3) Cr. 3 S. Prereq. Corn S 175, Stat 104. Principles underlying forest resource measurement tools and techniques. Application of sampling methods appropriate for investigating forest resources. Sampling methods include stratified sampling, point sampling, and 3P sampling.

256. Dendrology. (Bot 256) See Botany.

300. Forest Resource Management. (3-0) Cr. 3 S. Current status of the forest resource in the United States. Technical aspects of energy, silviculture, and cultural methods of concern to the specialist in forest-related activities. Emphasis on non-industrial private forests. Fire.

301. Silviculture. (3-3) Cr. 4 F. Prereq. 201, Bot 207. Effects of genetic, physiological, and environmental factors on processes underlying forest tree and stand growth.

302. Silviculture. (3-3) Cr. 4 Prereq. 201, Bot 207. Effects of genetic, physiological, and environmental factors on processes underlying forest tree and stand growth. Fire.

332. Dynamics of Forest Stands. (2-3) Cr. 3 S. Prereq. 241. Examination of factors affecting individual tree and forest growth. Estimation of crop yield and yield of even-aged and all-aged stands.

344. Forest Resource Surveys. (2-2) Cr. 3 F. Prereq. Stat 104, a course in natural resources. Measurement and inventory techniques applicable to various forest resources such as fish, fences, range, recreation, water, and wildlife.

357. Forest Soils. (Agron 357) See Agronomy.

360. Forest Recreation Resource Management. (3-0) Cr. 3 S. Planning and management of natural resource recreation resources, behavioral aspects of human recreation behavior, techniques to control human behavior and to protect the natural environment.

360L. Forest Recreation Field Studies. (3-0) Cr. 1 S. Prereq. Classification in 360. Field application of environmental management techniques. Visits to recreation sites to observe management programs and problems. Reports required. Open to forestry majors only. Fire.


380. Basic Properties and Proper Use of Wood. (3-0) Cr. 3 F. Prereq. 110. Consideration of important basic, solid wood properties and how such properties relate to proper use. An overview of solid, glued, and fiber products, wood use trend and raw material base for forest products.


390. Forest Fire Protection and Management. (3-0) Cr. 3 F. Prereq. 201. Characteristics and role of fire in forest ecosystems. Major topics covered include fuels, fire weather, fire behavior, fire danger rating systems, fire control, and prescribed burning.

397. Forest Regulation and Operations. (3-0) Cr. 3 F Prereq. 241. Principles of organizing, regulating, and administering forest lands in conjunction with commercial harvest and multiple-use uses for both public and private ownership.


445. Natural Resource Photogrammetry and Photo-Interpretation. (C.E. 414) (3-2) Cr. 2 F Prereq. 3 credits in physical sciences. Use of aerial and terrestrial photographs or remote sensing methods in resource management with emphasis on multiple-use forests. Training in techniques of photo measurement, interpretation, and mapping plus procedures for forest inventory. Principles of remote sensing.


454. Forest Resource Case Studies. (1-4) Cr. 3 S Prereq. 20 credits in forestry courses at 300 level or above. Applied case studies of forest resources management to illustrate methods of synthesizing the economic, mathematical, biological, political, and administrative problems in forestry. Field trips and discussion sessions arranged.

470. Resource Allocation in Outdoor Recreation. (2-0) Cr. 2 F Prereq. 360, Econ 201. Analysis of factors affecting recreational use of forest resources. Current recreation issue areas and recent literature.


485. Wood Gluing and Fabrication. (2-3) Cr. 3 Alt. S offered 1981. Principles of the use of adhesives to produce plywood, glued laminated members and particleboard, use of wood residues; combining wood with other materials; lumber grading; fabrication techniques and structures.


487. Physical Properties and Mechanical Conformalization of Wood. (3-3) Cr. 4 Alt. F. offered 1982. Prereq. 380, 380L. Timber mechanics; thermal and acoustical properties of wood; wood machining; sawing.
450 Institute Study. Cr. 1 to 4 each time elected.
Fres. Jr. or senior level.
A Forest Biology
B Forest Geology
C Forest and Recreation Economics
D Forest Management
E Wood Science
F Range Management
G Forest Photography
H Honors Program
I Forest Recreation Resource Management
451 Forest Range Management. (4.5) Cr. 2, S, 1st & 2nd 8 weeks. Prereq. 3 courses in biological sciences. The place of forest management in multiple-use land management. Impact of past practices on the range, present management problems and policies as they concern public and private land managers. Technical questions of computing capacity and balancing competing uses.

Credit for both 414 and 445 may not be applied toward graduation.

Courses Primarily for Graduates, Students, or Minor, or open to qualified undergraduates
500. Seminar. (1-0) Cr. 1 each time taken. S. Prereq. Permission of instructor.

Research, reports, and conference literature.

Genetic principles as they apply to selection and breeding of forest trees. Variation and genetic systems in trees, selection techniques, polyploidy, forest biology, common hybridization techniques and operational tree improvement programs.
509. Special Topics. Cr. 2 to 4 each time elected.

4. Cr. 15 credits of acceptable graduate work, permission of the instructor.

A Forest Biology
B Forest Geology
C Forest and Recreation Economics
D Forest Management
E Wood Science
F Range Management
G Forest Photography
H Forest Recreation Resource Management
594. Advanced Forest Resource Management. (3-0) Cr. 3. F. Prereq. 454. A seminar approach to the critical analysis of forest management problems as exemplified in public agencies and private firms.

599. Research. Cr. 1 to 8.

A Forest Biology
B Forest Geology
C Forest and Recreation Economics
D Forest Management and Administration
E Wood Science

Courses for Graduate Students, Major, or Minor
601. Research Methods. (3-0) Cr. 3. F. Prereq. Permission of instructor.

Forestry graduate student orientation, departmental research philosophy and program. Student and faculty research presentations. Scientific method, hypothesis formulation and testing.

In addition to the above services, the broad range of technical experience within the department faculty makes it possible to offer a variety of courses in support of other curricula.

Courses Primarily for Undergraduate Students
101. Orientation. (1-0) Cr. R F S. An orientation to the engineering college investigation of professional fields and considerations in selecting an engineering career.

125. Graphic Communications. (2-4) Cr. 3. F S S S. Introduction to various forms of graphic communication used by designers. Development of proficiency in basic drafting skills including layout, line quality, use of equipment, and lettering. The use of single and multiview drawings including sectioning and dimensioning, and pictorial drawing systems with emphasis on perspective. Presentation drawings using shadows, shades, and reflections.

145. Architectural Graphics I. (2-4) Cr. 3. F S S S. Architectural graphics fundamentals with emphasis on excellence and accuracy, lettering and use of instruments. Orthographic projection theory, including use of auxiliary planes, revolution, geometry of points, lines, planes, and solids. Determination of intersections, angles and clearances involving lines, planes, and solids with applications. Pictorial drawings in isometric and oblique. Roof plane in fascia systems. Toms, including land mapping and site planning. Plans, sections, elevations, and associated conventions for design presentations.


155L. Engineering Problems Laboratory. (0.2) Cr. 1. F S. Prereq. Classification in 155. Solution of engineering problems using a large scale computer. Programming, problem solving, and computer terminals. Must be accompanied by 155.


190. Special Problems. Cr. 1 to 5 each time taken. Experimental courses or honors seminars pertaining to topics common to more than one engineering curriculum.

290. Advanced Graphical Problems. Cr. 1 to 5. S. Prereq. Permission of department chairman. Advanced graphical theory and techniques tailored to any subject area approved by the department advisor. Some example topics are: design layout drawing, true position dimensioning and geometric tolerancing, architectural detailing, map and contour drawing, production illustration, analysis of empirical data, graphical calculus, nomography. Other topics investigated on request.
The general master's degree is considered a terminal master's degree, those wishing to pursue the doctorate should enter departmental programs. Those who elect general graduate study must contribute a minimum of 10 credits toward the 35 graduate credits required for the degree. Each of the three areas chosen must be specifically authorized for graduate study in the department. Graduate studies are allowed to take courses in three different areas of graduate study, with the credit hours assigned to the appropriate courses.

Graduate study is open to graduate students who wish to have a thorough undergraduate foundation in a biological, social, or physical science with evidence of excellent scholarship and aptitude for scientific research. The department offers the student the opportunity to work in such areas as Drosophila, mouse, soybean, population, statistical, immunological, microbial, biochemical, developmental, and mammalian cell genetics. Minor work may be taken in agronomy, animal science, bacteriology, biochemistry, botany, horticulture, mathematics, statistics, veterinary medicine, and zoology. The department also participates in the interdepartmental programs of Molecular, Cellular, and Development Biology and Immunobiology (see Index).

Graduate study offers a substantial background for advanced training in genetics. This is demonstrated by the broad cultural and philosophical aspects of this biological science.

Open to graduate students for minor credit only 460.

Courses primary for undergraduate students

*260. Human Heredity and Society. (3-0) Cr. 3. F. Prereq: Biol 109 or Anthro 219. A survey course in genetics for non-biology majors interested in heredity and its importance, and implications to self and society. Not recommended for those intending to take advanced courses in genetics. Evolution, the informational molecules of life, laws of inheritance, population genetics, human inheritance, social, ethical, and political issues in genetics.


Independent study. Cr. arr. Prereq: 320 or 330.

Courses primary for graduate students, major or minor, open to qualified undergraduates

501. Hereditary Mechanisms. (2-0) Cr. 2. F. Prereq: Undergraduate courses in biology and genetics. Topics: Reproductive analysis in procaroytes and eukaryotes, variation in chromosome structure, aneuploidy and euploidy in plants and animals, gene structure and function, and mechanisms of sex determination. Designed primarily for graduate students in an agricultural discipline.

534. Molecular Development and Differentiation. (2-0) Cr. 3. S. Prereq: 501 and Bot 444. Palmer: Laboratory methods and techniques for cytogenetical research, with emphasis on plants.


590. Special Topics. (0.5-9) Cr. Arr. Prereq: 330 or 320.

599. Research.

Courses for graduate students, major or minor

610. Genetics of Bacteria and Bacteria Virology. (Bact 610) See Microbiology.

615. Molecular Immunology. (B. B. 615) See Biochemistry and Biophysics.


690. Seminar. Cr. 1. F.

698. Seminar in Molecular, Cellular and Developmental Biology. (MCD 698) See Molecular, Cellular, and Developmental Biology.

699. Research.

Geodesy and Photogrammetry

For description of courses, see Civil Engineering.
Geography
For description of course, see Earth Sciences.

Geology
For description of courses, see Earth Sciences.

Gerontology
(Interspecial Minor)
D. C. Charles, Chair, Supervisory Committee

Supervisory Committee: P. A. Garcia, W. Hutchison

Work is offered for an interspecial graduate minor with the following departments participating in the program: Architecture, Biochemistry and Biophysics, Business Administration, Economics, Family Environment, Food and Nutrition, Home Economics Education, Physical Education, Political Science, Professional Studies in Education (Adult Education), Psychology, Sociology and Anthropology, Speech, and Textiles and Clothing.

A declared graduate minor in gerontology consists of a minimum of 12 credits taken from a list of acceptable courses, and from at least two departments. Nine of these 12 credits will be in courses focused specifically on aging. At least one member of the gerontology program will be on a student's advisory committee; this person must be at least an associate member of the Graduate Faculty for a master's committee and a full member for a doctoral committee. Because gerontology is a rapidly developing area, departments participating in the minor and specific course offerings may change in the future. Contact the chair of the supervisory committee for information on the program and for the list of courses in the graduate minor in gerontology.

History
Richard Lowitt, Chair of Department

Professors: Apt, Cravens, Dobson, Keller, Koltmann, Lowitt, Schofield

Professor Emeritus: Geiger

Associate Professors: Armaitides, Bennett, McCarthy, McJimsey, Pilakas, Rawson, Whitaker, Wilson, Witt

Assistant Professors: Madison, Marcus, Osborn, Zaring

Instructor: Schneider

Undergraduate Study
For the undergraduate curriculum in sciences and humanities, with major in history, see Sciences and Humanities, Curriculum

The department offers a variety of introductory courses (200 series) designed to serve either general education or as introductions to certain advanced courses in history or other subject areas. Advanced undergraduate courses are offered in the history of Europe, Asia, Latin America, the United States, technology and science, and in other selected topics.

The prospective major may earn either a Bachelor of Arts or Bachelor of Science degree. Candidates for the Bachelor of Arts must complete a two-year foreign language sequence in one language. Anyone who wishes to pursue graduate study in history should acquire proficiency in at least one foreign language.

The minimum required for a major in history is 30 credits, of which at least 24 must be above the 200 level. One seminar in history is required; i.e., all history major programs must include 495 or one graduate-level seminar.

The college requires no minor. Those students who wish to major in history may take as many courses as they desire, subject to the requirements of the graduate program.

Graduate Study

The department offers work for the Master of Arts degree with a major in history, for the Master of Arts and Doctor of Philosophy degrees with a major in history of technology and science, and minor work for students majoring in other departments. For admission and degree requirements for work in history of technology and science, see separate departmental procedures.

For the M.A. in history, students may elect a thesis or a non-thesis program. The foreign language requirement is subject to the approval of the graduate committee. The requirement for a non-thesis program is subject to the approval of the graduate committee. All graduate courses must be taken under the direction of a graduate-level seminar. The final examination for students in the non-thesis program is based on a written exam and a comprehensive oral exam, as determined by the student's advisory committee.

The Master of Arts in history program serves as a basis for continued study in history, law, or business; preparation for teaching in high school or junior college; preparation for government service; or as part of a general education.

The department participates in the interdepartmental program of Technology and Social Change. (See index.)

Open to graduate credit, major or minor: all 400-level courses.

A history graduate student may take any 400-level course except 490 and 495 for major graduate credit; however, no more than 12 credits of 400-level courses may be used toward the minimum credits required for the degree as listed on the program of study. Additional work is required for graduate credit.

Courses Primarily for Undergraduate Students

History of Europe (Hist)

*201, 202. Introduction to Western Civilization. (3-0) Cr. 3 each. F.S. Western civilization from ancient Mediterranean world to the present. Social and cultural developments; economic and political ideas and institutions; problems of historical change and continuity. 201 to 1650. 202. Since 1650

*325, 326. History of England. (3-0) Cr. 3 each. F.S. 325: England from pre-history to 1868. Growth of political and religious institutions, medieval social, economic, and constitutional development, Tudor and Stuart monarchies; Reformations and civil war. 326: England since 1868. Political and social change constitutional and economic development, Britain as a world power, modern British society.

*401. Ancient Near East, (3-0) Cr. 3 F. A. Avraamides. Political, economic, social, and religious history of ancient Mesopotamia and Egypt.

*402, 403. Ancient Greece and Rome. (3-0) Cr. 3 each. F.S. Avraamides 402. Ancient Greece from the Bronze Age to the Hellenistic Kingdoms, the evolution of the Greek polis and its cultural institutions. 403. Ancient Rome from the founding of the city of Rome to the rise and decline of the Roman Empire, its political and administrative institutions and cultural contributions.

*404. History of Medieval Europe. (3-0) Cr. 3 each. F.S. Madison Development of political, economic, and social institutions. 405 Early and Central Middle Ages, 284-1050. 406. High and Late Middle Ages, 1050-1500.

*407. Medieval and Renaissance Italy. (3-0) Cr. 3 F. Madison. Development of the city-states of the Italian Peninsula, the rise of the signori, new intellectual directions, and history of technology.

*408. Europe, 1500-1648. (3-0) Cr. 3 Alt. S. Taring. The Northern Renaissance, the Church and Luther, Protestant reform and Roman-Catholic counter reform, social, cultural, and economic changes, Spain in triumph and decline, religious wars and the emergence of France.

*410. 19th Century Europe. (3-0) Cr. 3 F. Apt. Europe in the age of nationalism, revolution, and imperialism.

*411, 412. Contemporary Europe, (3-0) Cr. 3 each. F.S. Will. 411: Europe from the 1890s to the 1930s. 412: Europe since the 1930s with emphasis on the origins, course, and effects of World War II.


*415. European Society in the Age of Enlightenment. (3-0) Cr. 3 Alt. F. F. O. 415: Europe from the mid-seventeenth century to the French Revolution, with emphasis on social structure and the culture of the transition from a medieval to a modern society.

*417. European Society and the Industrial Revolution. (3-0) Cr. 3 Alt. S. Apt. Europe and the continent during the period of European industrialization, with emphasis on the relationship between industrial and social change.

*419. French History. (3-0) Cr. 3 F. Apt. France from the beginning of the eighteenth century to the present.

*421, 422. History of Russia, (3-0) Cr. 3 each. Yr. Rawson. 421: Russia to 1825. Origins of the Russian people; Byzantine influences; Mongol invasion, rise of Moscow, advent of Westernization. 422: Russia since 1825. The role of autocracy; era of reforms; conflict between state and society; revolution, transformation, and modernization of society in the Soviet period; the USSR as a world power.

*424. History of Modern Germany. (3-0) Cr. 3 each. F. S. Will. Cultural, economic, and political developments in nineteenth and twentieth century Germany.

*425. Modern Central and Eastern Europe, (3-0) Cr. 3 Alt. S. Will. Social, political, and cultural developments in the Balkans, Russia, and the countries of the former Soviet Union.

*426. Modern Central Europe, (3-0) Cr. 3 Alt. S. Will. Social, political, and cultural developments in Central Europe.

*427-428. Medieval Europe. (3-0) Cr. 3 each. F.S. Madison Development of religious society and government examined through contemporary sources in translation Legal and constitutional developments emphasized.

*429. Ancient Greek History. (3-0) Cr. 3. F.S. Madison. Development of political, economic, social, and cultural development in Greek society. The origins of democracy, the rise of Sparta, the role of Athens, and the impact of Greek culture on the development of the Western world.

*430, 431. Modern England. (3-0) Cr. 3 each. F.S. Zearing. 430: England from 1688 to 1830. Political, social, cultural, and economic developments. 431: England since 1830. Parliamentary and constitutional development, social reform and economic change, Imperial Britain, the welfare state.
454. Politics and Sectional Conflict. (3-O) Cr 3 F
McJumsey Origins of second party system. Social and economic forces that sustained the system and ultimately caused its collapse and sectional division, 1815-1861

455. The Civil War and Reconstruction. (3-O) Cr 3 S
McJumsey Emphasis on military and political events of the Civil War and their influence on postwar America, 1861-1877

457. The Populist-Progressive Years. (3-O) Cr 3 S
Dobson The United States transition from an agrarian society to a modern industrial society, emphasizing political, economic, and social developments of the late 19th and early 20th century.

*458. 469. U.S. Since World War I (3-O) Cr 3 each F

*462. 463. American Thought and Culture Since 1867
Cr 3 each Alt F Cravens, Frenz American cultural values and social and political thought from the seventeenth century to the present. 462. The rise of the middle-class republic, 1657-1865, the role of religion, rationalism, and republicanism in the seventeenth and eighteenth centuries. The Enlightenment and Revolution. The Revolution's legacy: the democratic mode in politics, religion, the economy, society, and culture, impact of Civil War and industrialization.

463. American democracy in the Machine Age, 1865 to the present multimedia inquiry into special social thought, moral values, and culture in the urban-industrial era, 1920-1945 as a turning point, the contemporary situation.

464. Nineteenth Century Social History. Cr 3 Alt F Schwender Rise of modern industrial society in nineteenth-century America, the family, churches, and other social institutions, immigration, social and political mobility, social, economic, and ethnic stratification.

465. The Westward Movement and Frontier Development. (3-O) Cr 3 S Whittaker Occupation distribution, and political organization of the public domain. Indian-white relations, particularly in the westward movement.

466. History of the United States Foreign Policy. (3-O) Cr 3 each F Cravens, Kottman Diplomatic history emphasizing the growth of American influence around the world and the resulting consequences and conflicts. 466. Diplomatic history of American Revolution, America's rise as a world power, the First World War and postwar entanglements. 466. Diplomatic relations from 1800 to the present, including U.S.-Soviet relations, the Second World War, and the Cold War.

467. History of Technology and Science (Hist)
The undergraduate program in history of technology and science has been structured to offer a sequence of courses leading from basic surveys through new courses in the history of particular technologies. Students may also choose from a variety of courses in science and technology such as the science of physics and the branches of engineering, the history of technology and science in the social and cultural context of the western world.


469. History of Physics and Physical Engineering. (3-O) Cr 3 F Wilson A study of the development of physics, the nineteenth-century creation of thermodynamics and the sciences of the ether and waves in scientific thinking, associated with Einstein and Bohr.

470. History of American Technology. (3-O) Cr 3 Alt F, offered 1981 McCarthy Comparative approaches to the history of technology and science, focusing on specific technologies associated with industrial revolution, the science of physics and the branches of engineering associated with it, from the postNewtonian era to the present.

471. Problems in Nineteenth and Early Twentieth Century Physics. (3-O) Cr 3 Alt F, offered 1963 Wilson A study of two revivals in physics, the nineteenth-century creation of thermodynamics and the sciences of the ether and waves in scientific thinking, and the science of physics and the branches of engineering associated with it, from the postNewtonian era to the present.

472. History of American Agriculture. (3-O) Cr 3 each F, S Dobson Agricultural development from colonial times to the present. 472. European background. colonial period to 1865. 472. 1866 to the present.

473. History of Agriculture. (3-O) Cr 3 each F, S Dobson Agricultural development from colonial times to the present. 473. European background. colonial period to 1865. 473. 1866 to the present.

474. History of Women in America. (W, S) (3-O) Cr 3 F A survey of social, economic, and political aspects of women's role from the colonial era to the present. 474. Focus on employment, education, domestic roles, social organizations, politics, and historical development of the United States. 1800 to 1900, 1900 to 1935, 1935 to 1990.

475. History of Agriculture. (3-O) Cr 3 F Keller Exploration, colonization, and development of political, economic, social, and cultural institutions of the North American colonies before 1754.

476. America's Cultural Landscape. (3-O) Cr 3 S Keller Participants, ideas, and events leading to the foundation of the American Republic, 1754 to 1877.

477. The New Nation. (3-O) Cr 3 Alt F Development of the political institutions and the social, economic, and cultural fabric of the new nation from 1787 to 1828.
382. United States Economic History. (3-0) Cr. 3. S. McCarthy. Origins and evolution of United States capitalism; importance of varieties of economics, importance of legal structures, growing interdependence of power sectors.

384. History of the Family in the Western World. (3-0) Cr. 3. Alt F. offered 1981. Pekkanen Changing family forms in Western Europe from medieval times to approximately 1900, with the American familial experience as applied to this period.

390. Modern Military History. (3-0) Cr. 3. F. Witt. Relationships between war and society in the United States and Europe from 1815 to the present, special emphasis on the World War I and World War II experiences.

400. Independent Study. Cr. 1 to 3 each time taken. Prereq: 9 credits in history, permission of department chair. Reading and reports on problems selected in conference with each student.

495. Seminar in History. (3-0) Cr. 3. Prereq. Open to seniors, others by permission of instructor. Literature of major historical problems that have become subjects of dispute and valued interpretations among historians. Area of coverage varies.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates.

History of Europe (Hist)

512. Seminar in European History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Readings in European History. A) Ancient B) Medieval C) Modern

594. Seminar in European History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Topics vary each time offered. A) Ancient B) Medieval C) Modern

History of Asia, Latin America (Hist)

510. Seminar in East Asian History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Readings in East Asian History. Topics vary each time offered.

513. Seminar in Latin American History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Readings in Latin American History. Topics vary each time offered.

592. Seminar in East Asian History. (3-0) Cr. 3. S. Prereq. Permission of instructor. Topics vary each time offered.

595. Seminar in Latin American History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Topics vary each time offered.

History of the United States (Hist)

511. Seminar in American History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Readings in American History. Topics vary each time offered. A) Colonial Period B) Nineteenth Century C) Twentieth Century

593. Seminar in American History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Topics vary each time offered. A) Colonial Period B) Nineteenth Century C) Twentieth Century

Topical Courses

514. Seminar in Comparative Economic History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor. Readings in comparative economic history. Topics vary each time offered.

580. Museum Internship. Cr. varies each time taken. Prereq: 15 graduate credits in history, permission of instructor.


585. Teaching Methods. Cr. 1 to 3 each time taken. Prereq. Permission of instructor. Topics vary each time offered. A) Teaching Methods B) Curriculum Development in History C) Implementing Teaching Techniques

590. Special Topics. Cr. 1 to 3 each time taken. Prereq. Permission of instructor.

597. Seminar in Comparative Economic History. (3-0) Cr. 3 each time taken. Prereq. Permission of instructor.

598. Introduction to Archives and Special Collections. (3-0) Cr. 2 each time taken. Prereq. Graduate classification.

History of Technology and Science (Hist)

The graduate program in history of technology and science has been restructured with a new sequence of courses leading to the M.A. and Ph.D. degrees.

570. Seminar in General History of Science. I. II. (3-0) Cr. each Yr. Wilson. The history of science from pre-classical civilizations to the Age of Galileo, and from Galileo to modern times, with emphasis on the historical literature, varying interpretations of the period, and problems for continuing research.

574. Seminar in General History of Technology. I. II. (3-0) Cr. each Yr. Marcus. The history of technology from pre-classical times to the Industrial Revolution, and from the Industrial Revolution to modern times, with emphasis on the historical literature, varying interpretations of the period, and problems for continuing research.

576. Seminar in Histo1ogy of Technology and Science. I. II. (3-0) Cr. each Yr. Schofield. Investigation in the bibliography, philosophy, and professional problems of the history of technology and science. Required of all graduate students in the history of technology and science program.

Courses for Graduate Students, major or minor


602. Seminar in Nineteenth Century Science. (3-0) Cr. 3 Alt F. offered 1981. Prereq. Permission of instructor. Emphasis varies each time offered.

603. Seminar in Nineteenth Century Technology. (3-0) Cr. 3 Alt S. offered 1982. Prereq. Permission of instructor. Emphasis varies each time offered.


699. Research.

Home Economics Education

Ruth P. Hughes, Head of Department

Professors: Beavers, Elliott, Fanslow, Hughes

Emeritus Professors: Chadderdon, Paddock

Associate Professors: Gerger, Schultz, Smith, Van Maanen, Williams

Assistant Professors: Amos, Beery, Ebert, Hausafus, Ralston, Torne

Undergraduate Study

For undergraduate curriculum in home economics education leading to the degree bachelor of science, see Home Economics Education and/or Adult Home Economics Education.

The department offers work for the degree Bachelor of Science with curricula in home economics education, which prepares students for careers in vocational consumer and homemaking education and in diversified occupational home economics for grades seven through fourteen and adult home economics education, which prepares students for adult education in extension, business, and area schools and community colleges. Under the home economics education curriculum, two additional options are available specific occupational areas and health education.

Students may enroll in the department as sophomores. To continue in the teacher education program, students in the home economics education curriculum must apply to and be accepted by the departmental committee, the College of Home Economics Committee and the University Teacher Education Committee. (For certification requirements, see College of Education.) Students in the adult home economics education curriculum must apply to and be accepted by the departmental committee and make reservations for adult teaching experiences.

Vocational Education Qualifications

The home economics education curriculum is approved by the State of Iowa Department of Public Instruction for the preparation of vocational home economics teachers.

Graduate Study

The department offers work for the degrees Master of Science, Master of Education, and Doctor of Philosophy with major in home economics education. Minors are available for students who are majors in other departments.

Students majoring in home economics education should have fundamental knowledge of psychology, education, sociology, and home economics. Each program of study is planned to meet individual needs.

Courses in statistics are included in the program of study for the Master of Science and Doctor of Philosophy degrees with a higher level of competence required for the degree of Doctor of Philosophy.

Open to graduate students for minor credit only: 410, 413.
Courses Primarily for Undergraduate Students

305. Introduction to Teaching Home Economics. (1-2) Cr 2 F S Prereq Sophomore classification.
Introduction to the various roles of the home economist in educational settings. Microteaching and observation-participation. Fee

306. An Experience in Multicultural Awareness. Cr 1 Intern. Experiences designed to aid future teachers become aware of diversity of ethnic and racial groups in an inner city educational setting. Experiences in minor city or in other racial/gentic settings. Offered on a satisfactory-fail basis only. Fee

318. Occupational Home Economics. (1-0) Cr 1 F S Prereq. 400 hours in an appropriate paid work experience in paraprofessional home economics jobs. Organization, outlook and current trends in occupational home economics. Job analysis, coordination and evaluation techniques examined.

408. Supervised Experiences in Adult or Extension Education. Cr 5 S Prereq. 410, 411, 36 credits in home economics subject matter. Approved experiences under directions of extension or adult programs. Advance reservation required.

410. Educational Principles for Home Economics. Offerings. (2-0) Cr 2 F S Prereq. 20 hours in home economics subject matter. Use of principles of learning in developing instructional strategies and evaluation techniques. Program development appropriate for formal and informal offerings in home economics.


418. Supervised Experiences with Adults in an Educational Community. Cr 2 S Prereq. Classification in 408. Supervised professional experience in studying the educational needs of the given community. Analyzing the relationships of adult educational programs sponsored by community organizations, libraries, business concerns, and the public schools.

419. Supervised Experiences in a Public School Community. Cr 2 F S Prereq. Classification in 417. Supervised professional experience in studying educational programs outside the public school. Analyzing the relationships of the public school programs to educational programs involving community organizations, agencies and key persons in the community.

420. Seminar in Home Economics Education. (1-0) Cr 1 F S Prereq. Senior classification. 417 preferred. Examination of ways to implement in educational settings, actions which reflect a personal philosophy of home economics. Application of leadership styles to the educator's role.


Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates.

500. Short Courses. Cr Arr. SS Prereq. Permission of instructor.
A Adult Education C Curriculum D Evaluation F Supervision I Teacher Education M Teaching Strategies

505. Workshop. Cr 1 or 2 S Prereq. Permission of instructor. Concentrated group study of problems in fields of home economics education. Section offered will vary from year to year.

A Adult Education C Curriculum D Evaluation F Supervision G General N Human Relations O Future Homemakers of America P Special Needs

507. Curriculum Development in Teaching Vocational Home Economics. (3-0) Cr 3 F S Prereq. Supervised teaching experience. Application of new knowledge, career development and educational theory to curriculum planning in both consumer and homemaking and occupational programs. Coordination and laboratory techniques for occupations program included.

508. Methods of Teaching Adult Vocational Home Economics. (2-0) Cr 2 S First 8 weeks Prereq. 411 Planning and organizing adult home economics education programs for young, middle-aged, and older adults. Selection, use, and evaluation of teaching techniques suited to group work with adults and to informal education in home economics.


590. Special Topics. Cr Arr. Prereq. 6 credits in educational psychology.

Courses for Graduate Students, major or minor.


610. Seminar. Cr 1 each semester F S Offered on satisfactory-fail basis only
Horticulture

Charles V. Hall, Head of Department

Professors: Buske, Buck, Denisen, Hall, Hodges, Mahlsted, Nichols, Wetlge

Professors Emeritus: Cott, Schiller

Associate Professors: Donato, Kelley, Sherwood, Tisher

Assistant Professors: Bhillu, Christians, Gladon, Heffley, Simmons, Suther

Undergraduate Study

For undergraduate curriculum in horticulture leading to the Bachelor of Science degree, see 

Horticulture, Cumulm.

The horticulture curriculum is designed to permit commodity emphasis on general horticulture, ornamental horticulture, floriculture, fruit production, vegetable production, nursery management, light, temperate, vegetable, water, and turfgrass management.

Specialization options complete the educational goal by combining one of the above interest areas with those skills required in production and business management, communication and public service, science or turfgrass management.

The rapidly expanding field of horticulture provides employment opportunities in nurseries, florists' shops, greenhouses, garden centers, orchards, and commercial plants. The large agricultural industry associated with horticulture provides employment in the areas of sales and management. Turf managers are needed for golf courses, athletic fields, and parks. Further opportunities exist in sod production, landscape development and maintenance, as well as botanical gardens, conservatories, and arboreta.

A new area, just beginning to grow, is the use of horticulture as a therapeutic tool in working with the emotionally ill, handicapped, and disadvantaged.

Opportunities also exist for further education in graduate school to prepare for a career in research, teaching, or extension.

Students have the option of selecting a secondary major in interdepartmental programs: Pest Management, Crop Science, Agricultural Extension Education, or International Agriculture (See Index).

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with major in horticulture, and minor work for students taking work in other departments. Under special circumstances a nonthesis master's degree is available.

Prerequisite to major graduate work is the completion of courses covering horticulture, botany, and the underlying sciences.

Students taking major work in horticulture usually will take minor work in agronomy, genetics, botany (physiology, pathology, cytology, or morphology), entomology, statistics, or chemistry.

There is no uniform foreign language requirement for either the Master of Science or the Doctor of Philosophy degree.

The department also cooperates in the interdepartmental program of Water Resources (See Index).

Open to graduate students for minor credit only: 432, 433, 442, 461, 462, 471.

Courses Primarily for Undergraduate Students

110. Orientation in Horticulture. (1-0) Cr. F, R.

112. Indoor Plants and Gardens. (2-0) Cr. F, S.

Methods for growing house plants, gardening in containers such as terrariums, hanging baskets, etc., interior landscaping. Plants materials manufacturing.

121. Outdoor Plants and Gardens. (2-0) Cr. F, S.

Designing, planting, and maintaining flower, fruit, and vegetable gardens; lawn, tree, and shrub identification and maintenance.

131. Introductory Floral Design. (1-2) Cr. F, S, S.

Principles, mechanics, and uses of floral arrangements, conditioning and preparation of floral arrangements, and plant materials.

221. Principles of Horticulture. (2-0) Cr. F, S, S.

Principles of growing horticulture crops including annual and perennial, light, temperate, vegetable, and turfgrass management.

Specialization exercises emphasize environmental factors and permit detailed observation of plant growth.

225. Formulation and Application of Pesticides. (Phy) 3 Cr. F, S.

Theory, mechanics, calibration, use, and maintenance of various types of equipment used in the application of pesticides for pest management and plant improvement. Included are formulation, compatibility, use, and safety.

232. Herbaceous Ornamental Plants. (4-0) Cr. F, S.

Principles of herbaceous and suffrutescent plants in the floral industry.

Emphasis on environmental relationships and environment required to successful usage, diagnosis, and treatment of management problems.

241. Woody Ornamental Plants. (2-0) Cr. F.

Classification and description of woody ornamental plants.

322. Plant Propagation. (2-0) Cr. F, S, S, or Bot 207.

Fundamental principles underlying sexual and asexual propagation of plants, plant reproduction phases, sites, and roots.

332. Greenhouse Structures and Crops. (3-0) Cr. F, S.

Production of commercial florists' major bench crops and potted plants. Structures and equipment necessary for such production.

342. Landscape Establishment and Maintenance. (2-0) Cr. F, S.

Principles and practices involved with establishment and maintenance of woody ornamental plants and turfgrasses in the landscape. Selection of plant materials in relationship to environmental factors as stressors.

351. Turfgrass Establishment and Management. (Agron 351) (2-0) Cr. F, S, or Agron 114 or Agron 110 or Bot 207.

Principles and practices of turfgrass propagation and management. Specialization practices relative to home lawns, golf courses, athletic fields, highway roadides, and seed and sod production.

391. Horticultural Management Experience. (2-0) Cr.

Maximun of 3 Cr. F, S, S, or Agron 114.

Permitting students to gain insight into management operations associated with production of horticultural crops. A comprehensive report is required. Offered on a satisfactoy-fail basis only.

410. Seminar. (1-0) Cr. F, S.

Permitting students to gain insight into management operations associated with production of horticultural crops. A comprehensive report is required. Offered on a satisfactoy-fail basis only.

422. Retail Floriculture. (2-0) Cr. F.

Principles of the instructor's florists' qualifications, business aspects, professional organizations in the industry, and merchandising. Laboratories include designing and servicing floral displays and judging floral quality. Extensive reading required. Fee for field trips. Plant materials fee.

433. Tropical and Subtropical Ornamental Plants. (2-0) Cr. F.

Permitting students to gain insight into management operations associated with production of horticultural crops. A comprehensive report is required. Offered on a satisfactoy-fail basis only.


Principles of the instructor's florists' qualifications, business aspects, professional organizations in the industry, and merchandising. Laboratories include designing and servicing floral displays and judging floral quality. Extensive reading required. Fee for field trips. Plant materials fee.

461. Small Fruits. (1-2) Cr. F, S.

Principles and practices involved in handling home and commercial vineyards and plantations of strawberries, bush fruits, and miscellaneous small fruits.

462. Fruit and Nut Culture. (2-0) Cr. F, S, S.

Principles and practices of the fruit and nut culture and production. Planting, pruning, propagation, maintenance, pest control, and physiology of growth and development.

471. Vegetable Crops. (3-0) Cr. F, S.

Principles and practices of vegetable production. Methods of maximizing yield and quality of vegetables, Harvesting, storage, and marketing.
Housing
(Interdepartmental Minor)

G. E. Bivens, Chair, Supervisory Committee


Work in housing is offered for the degrees Master of Architecture, Master of Landscape Architecture, Master of Arts or Master of Science as appropriate in the following cooperating departments or major areas. Art and Design, Architecture, Family Environment, Landscape Architecture or Community and Regional Planning.

A student in housing will major in one of the cooperating departments and will develop a program for study under the guidance of a committee nominated by the advisory committee and appointed by the dean of the Graduate College.

The major professor will be in the cooperating department in which the student majors. The degree will be in the major department with a minor in housing.

Programs in housing should be planned to include courses from several of the following departments.

Art and Design: 590E, 699J
Architecture: 466, 467, 468, 507, 563, 566, 577, 590
Construction Engineering: 371, 372
Economics: 401, 402, 405, 461, 480, 565, 566
Landscape Architecture: 590, 650, 699
Political Science: 410, 471, 476, 510, 512, 571, 590G
Sociology: 410, 411, 415, 484, 556, 555, 575, 576
Statistics: 401, 402, 421
Community and Regional Planning: 360*, 383*, 395*, 405*, 492*, 511, 515, 520, 524, 527, 561, 575, 580, 592

*Graduate credit not available to majors in this department.

Immunobiology
(Interdepartmental Program)

D. E. Reed, Chair, Supervisory Committee

Supervisory Committee: D. L. Harris, A. Nordskog, C. D. Thoen, W. J. Zimmerman

Work is offered for the degrees Master of Science and Doctor of Philosophy with major in immunobiology under a cooperative arrangement with the departments of Agronomy, Animal Science, Bacteriology, Biochemistry and Biophysics, Food and Nutrition, Genetics, Veterinary Microbiology and Preventive Medicine, Veterinary Pathology, and Zoology. Facilities and qualified staff exist in such areas as immunogenetics, physiology of antibody formation, cell-mediated immunity, immunocytology, immunology, immunopathology, microbial immunology, immunoparasitology, and serology.

A student majoring in immunobiology will choose a major professor from the graduate faculty membership of cooperating departments and will develop a program of study under the guidance of a committee nominated by the major professor, approved by the chairman of the immunobiology program, and appointed by the dean of the Graduate College.

Students desiring to do graduate work with a major in immunobiology should have a bachelor’s degree or equivalent. A strong background in biological sciences is required, including work in immunology, genetics, and biochemistry. Students who do not have these prerequisites should plan to complete them in addition to the regular course requirements for the advanced degree. Proficiency in one foreign language is required for the M.S and Ph.D. degrees; the same language may serve for both. Proficiency may be demonstrated by passing one year of a college-level course or by an alternative, determined by the student’s program of study committee, which indicates proficiency in one foreign language. For students whose native language is not English, passing English proficiency examination will fulfill the language requirement.

Immunobiology students should include in their program of study a core of courses which will provide a broad coverage of the basic program in immunobiology. Formal courses in immunology, immunocytology, and immunoparasitology are recommended. The following listing should be utilized in the selection of core courses for inclusion in the program.

Courses for Graduate Students, major or minor

498 Principles of Immunology (VMPM 498) See Veterinary Microbiology and Preventive Medicine
520 Medical Immunology I (VMPM 520) See Veterinary Microbiology and Preventive Medicine
520L Medical Immunology Laboratory (VMPM 520L) See Veterinary Microbiology and Preventive Medicine
560 Immunopathology (VP 560, Micro 560, Zool 560) See Veterinary Pathology
575 Immunology (Micro 575) See Microbiology
590 Special Topics, 1 to 3 as arranged Offered on request. Prereq: Permission of instructor. Experimental methods applied in subdisciplines of immunobiology
A Immunology
B Immunocytology
C Immunogenetics
D Immunotoxicology
E Immunoparasitology
595 Immunobiology Seminar (1-0) Cr 1 S Prereq Permission of instructor
615 Molecular Immunology (B 615) See Biochemistry and Biophysics
623 Medical Immunology II (VMPM 623) See Veterinary Microbiology and Preventive Medicine
631 Immunologic Disease (VMPM 631) See Veterinary Microbiology and Preventive Medicine
699 Research

Industrial Administration
See Business Administration
Industrial Administrative Sciences

(Interdepartmental Program)

David B. Vellenga, Chair, Supervisory Committee

Supervisory Committee: W Q Meeker, Jr., D R. Starleaf, V. Tamashunas

Work is offered for the nonthesis degree Master of Science with a major in industrial administrative sciences under an interdepartmental arrangement. Cooperating departments include economics, industrial engineering, statistics and the School of Business Administration. A minor is offered for students majoring in areas other than industrial administrative sciences. The program of formal courses is oriented toward developing administrators or managers for all types of business and governmental organizations. Applicants need not have taken an undergraduate major in business or a related area. However, they are encouraged to obtain background in some of the following: calculus, statistics, accounting, marketing, finance, transportation, economics, industrial engineering, sociology, and psychology.

Students majoring in industrial administrative sciences will choose a major professor from the graduate faculty of industrial administrative sciences. The student's program of study will be developed with the guidance of an advisory committee selected by the student and the major professor, approved by the chairman of the Industrial Administrative Sciences Supervisory Committee, and appointed by the dean of the Graduate College. The program total of 36 semester credits includes work in the areas of human resource management, quantitative methods, economics, the business environment, applications (production, accounting, marketing, transportation, and logistics, and finance), business policy, and electives. The program agreed upon by the student and the student's committee shall include a sufficient number of 500 and 600 level courses to be consistent with quality graduate work on the master's level. Although this is a nonthesis degree, a creative component is required of each student. This is accomplished by taking a minimum of three credits in special topics from one of the cooperating departments.

Students minoring in industrial administrative sciences shall have a faculty member representing the interdepartmental program on their committee. At least six courses, one-half of which are on the 500 level, shall be selected from designated course offerings in at least two of the cooperating departments. A minimum of two courses must be included from courses chosen in any of the cooperating departments. A minor cannot include courses that are offered by the department in which the student is a major.

Submission of Graduate Management Admission Test or Graduate Record Examination aptitude test scores is required when seeking admission as a major in the program.

A partial listing of required or recommended courses for a major in industrial administrative sciences is as follows:

- Human resource management — selection to be made from Econ 596; IE 424; 425; Psych 450, 451.
- Quantitative methods — selection to be made from IE 511, 518, Stat 402, 432, 539.
- Economics and the business environment — Econ 495, 496, and Mgmt 510 required.
- Applications in business — required courses include Mkt 540, Fin 550, TrLog 560, Acct 580, and one industrial engineering production course, IE 551.
- Business policy — Mgmt 578 required
- Electives — courses are selected from the cooperating department and numerous complementary areas.

Industrial Education

William D. Wolansky, Head of Department

Professors: Miller, Parks, Sherick, Wolansky

Professors Emeritus: Carver, Wiener

Associate Professors: Arcy, Beno, Celina, Mckay, McPherson, Riley, Van Ast, Watkins

Assistant Professors: Bortz, Muench, Paige, Smith, Weber, Younger

Instructors: Brock, Hurst, Jorgensen, McConkey

Undergraduate Study

For the undergraduate curriculum in industrial education leading to the degree Bachelor of Science, see College of Education, Curricula.

The industrial education curriculum provides essential preparation for students who have a strong aptitude and interest for careers related to teaching and industry. Students have the opportunity to study in programs leading to certification to teach industrial arts in junior or senior high schools, or to secure industrial vocational-technical certification with endorsement 71 or teaching driver education, or to gain employment in industry in the areas of personnel, sales, communications, construction, service, production, and occupational safety.

In the teaching specialization, the student must apply for admission to the teacher education program and be approved by the teacher education committee in industrial education and by the University Committee on Teacher Education, College of Education. For admission and certification requirements, see College of Education.

Graduate Study

The department offers work for the degrees Master of Science, Master of Education, and Doctor of Philosophy with major in industrial education, and minor work for students taking major work in other departments. Within the industrial education major, a student may specialize in industrial vocational-technical education, industrial education, or occupational and traffic safety education.

Prerequisite to major graduate work is preparation equivalent to the completion of the undergraduate curriculum in industrial education at Iowa State University and adequate proof that the student ranks above average in scholastic ability. The student must also possess adequate promise as a leader within the profession.

Though the department stipulates no foreign language requirement for either the Master of Science or Doctor of Philosophy degree, it may be relevant in individual cases to specify competence in one or more languages. Students not electing the thesis option, master's degree level, will be required to complete a minimum of 3 credits of a creative component project.

The department participates in the interdepartmental program in Technology and Social Change. (See Index.)

Open to graduate students for minor credit only. IE Ed 464

Industrial Education (I Ed)

Courses Primarily for Undergraduate Students

110. Introduction to Industrial Education. (1-0) Cr. 1 F S Qualifications, opportunities, preparation, and duties of workers in industrial arts, vocational industrial education, occupational safety, and industry.

120. Introduction to Graphic Communications. (1-4) Cr. 3 F S. An introduction to the area with emphasis on the systems approach, technical graphics and photographic concepts.

130. Introduction to Materials and Processes. (1-4) Cr. 3 F S. An introduction to selected materials and processes used in manufacturing. Laboratory and lecture activities focus on industrial materials and processes. Fee.

145. Introduction to Energy. (3-0) Cr. 3 F S. A survey of energy sources with emphasis on ecology, consumerism, alternatives, energy conservation, storage, transmission, and transportation.

217. Introduction to and Observation in Industrial Arts Teaching. (1-2) Cr. 2 F S. Observation and active participation in actual teaching situations with emphasis on the professional and industrial arts teacher's philosophy and life style. An analysis of the student's career interests and capabilities.

221. Graphic Image Generation. (1-4) Cr. 3 F S. Industrial applications in the concepts and practices of graphic image generation. Line lithography, photo screen techniques.

222. Graphic Conceptualization. (1-4) Cr. 3 Prereq. 221. Rapid generation of new ideas through graphic images and theory of mechanical pictorial drawings.

224. Industrial Design Graphics. (1-4) Cr. 3 Prereq. 221. Study of technical graphics and industrial applications and practices.

227. Graphic Image Reproduction. (1-4) Cr. 3 Prereq. 221. Simulated industrial experiences dealing with graphic image reproduction, processing and management methods.


233. Materials Testing and Processing. (2-2) Cr. 3 Prereq. 231. Materials testing, and material processing as utilized in the manufacturing and construction industries.

235. Management of Materials and Processes. (1-4) Cr. 3 Prereq. 231. Theory and application of the mass-production enterprise system and management techniques used in industry. Fee.

240. Basic Electrical Energy. (1-4) Cr. 3 F S Prereq. 141. Introduction to sources, transmission, and utilization of electric energy on DC and AC circuit theory. Passive components, active circuit elements, test gear, and tools for students in industrial and technical education. Fee.

241. Introductory Energy Systems. (1-4) Cr. 3 Survey study of energy sources and systems within the automobile, emphasis on ecology, consumerism, alternative energy, conservation, storage, uses of test equipment for electrical, mechanical, fluid systems. Design for non-major Fee.
242 Energy Applications. (1-4) Cr 3 Prereq 140, 240
Conversion transmission, control of energy, emphasis on practical industrial applications

245 Basic Energy Conversion Systems. (1-4) Cr 3
Prereq 140, 240 Theory of conversion systems utilizing internal and external combustion engines, integrated systems, maintenance, use of test equipment and tools, ecological aspects Fee

300 Theory of Flight. (3-0) Cr 3 F Aviation weather, federal aviation regulations, aircraft performance, navigation, control, use of flight, computer and plotting, and medical factors for pilots Upon completion of the course, students are expected to pass the Federal Aviation Administration Private Pilot's Airman Certification Fee approximately $500.00

265 Basic Flight Laboratory. (0-3) Cr 1 Prereq Credit or classification in 260 and permission of Chief Flight Instructor Flight maneuvers and procedures necessary for solo flight operations. 20 hours of flight time Lab fee approximately $500.00

267 Advanced Flight Laboratory. (0-3) Cr 1 Prereq 265, 265 and permission of Chief Flight Instructor Cross-country flying using piloting, dead reckoning, and radio navigation, night flying 25 hours of flight time to meet requirements for the Private Pilot Certification Lab fee approximately $500.00

310 School Laboratory Safety. (3-0) Cr 3 Jr. classification Analysis of accidents and accident prevention in the secondary school Industrial Education laboratory Iowa Occupational Safety and Health Act (CTR 1910) and how it applies to Iowa schools Methods of instituting an effective accident prevention program

311 Industrial and Construction Safety. (Con E 311) (2-0) Cr 2 S Survey of the Federal and Iowa Occupational Safety and Health Act. Regulation and control of working environment of all employees with emphasis on the construction industry and on the current Federal Register 1926

312 Foundations of Industrial Arts. (3-0) Cr 3 F Historical and philosophical foundations of industrial arts education includes contemporary movements of the 60's and curriculum development procedures for industrial arts

322 Graphical Analysis. (1-4) Cr 3 Prereq 224 A graphical analysis of spatial relationships between points, lines, and planes

325 Construction Detailing. (1-4) Cr 3 Prereq 224 Conception and techniques of detailing and construction industries Emphasis on construction detail specifications, and mechanical systems for residential construction

326 Industrial Design. (1-4) Cr 3 Prereq 222 Product and three dimensions design and solving techniques as applied to industrial settings

327 Planographic Reproduction. (1-4) Cr 3 Prereq 277 Concepts and practices of multi-color planographic reproduction

328 Screen Process Reproduction. (1-4) Cr 3 Prereq 277 Methods, concepts, and industrial practices of screen process reproduction

334 Metal Processes. (1-4) Cr 3 Prereq 231 Principles and practices of bench metalwork, forging, heat treatment, welding, casting, pattern making, and sheet metal fabrication Fee

335 Materials and Processes of Construction (0-3) Cr 3 Prereq 231 Basic construction principles and practices including the use of hand and power tools, applications of hand and power tools, and safety practices in the construction industry Fee

338 Modern Materials: Design and Construction (1-4) Cr 3 Prereq 231 Advanced design and construction as applied to furniture, cabinet making, sporting equipment, and special fabrication Fee

342 Electrical Energy Applications. (1-4) Cr 3 Prereq 140, 240 Power supplies, amplifier and oscillator circuits for communications and control systems, closed-loop, digital and analog circuits, design and fabrication methods, circuit testing and analysis for students in industrial and technical education Fee

346 Energy Systems Assessment. (1-4) Cr 3 Prereq 240 Modern energy systems, the relationship to society, advances in energy technology, the future of energy utilization, ecology, economics. Industrial education students Fee

380 Supervised Industrial Cooperative Experience. Cr 1 to 3 credit hours elected. No more than 9 total. F S SPrereq Classification in industrial education, permission of cooperative coordinator Supervised work experience in industry

410 Facility Planning and Management in Industrial Education. (2-2) Cr 3 Principles and practices in evaluating and reorganizing existing facilities, purchasing materials and maintenance of equipment

415 Methods of Teaching Industrial Arts. (3-0) Cr 3 F.S. Prereq 222 Methods and techniques of teaching industrial arts, objectives, organization of subject matter, relationships, and evaluation Field trips to schools Pre-teaching laboratory experiences including microcomputer use

417 Supervised Student Teaching. A junior high school industrial arts. Cr. B Senior high school industrial arts Cr 8 Prereq 415 Opportunity to experience and observe the life styles of teachers and students and to learn and develop competence in methods and techniques of teaching and seminars to enrich experiences

421 Industrial Illustration. (1-4) Cr 3 Prereq 222 Methods and media of illustrating pictures for industrial use

423 Manufacturing Design Graphics. (1-4) Cr 3 Prereq 322 Preparation of working drawings for communicating new design ideas for machines, jigs, and fixtures, and other mechanical apparatuses as utilized in the manufacturing process

425 Construction Design Graphics. (1-4) Cr 3 Prereq 325 Emphasis on the design process and presentation methods of residential construction as taught in the secondary school

430 Industrial Plastics (1-4) Cr 3 Prereq 231 Plastics materials and processes. Tool design and production considerations of molding, forming, coating, and other plastics manufacturing processes Fee


442 Advanced Electrical Energy Applications. (1-4) Cr 3 Prereq 342 Use of current and electronic circuitry with emphasis on microcomputer systems design, fabrication, testing, applications Fee

445 Integrated Mechanical/Fluid Systems. (1-4) Cr 3 Prereq 224, 245 Modern mechanical/fluid systems Emphasis on control and utilization Fee

464 Aerospace Workshop for Educators (2-2) Cr 3 Aircraft, weather, navigation, and governmental regulations related to the fields of aerospace and aviation

480 Industrial Enterprise System (1-4) Cr 3 Prereq 30 credits in industrial education Simulation of mass production in industry with emphasis on management, personnel, research, development, production, marketing, and servicing of consumer products Students participate in a product manufacturing corporate structure Fee

490 Independent Study in Industrial Education. 1-5 credits

A Industrial Education
B Professional Methods
C Curriculum
D Drafting, Design, Planning
E Electricity - Electronics
F Instructional Methods
G Technical Training
H Honors
M Metals
P Power
R Plastics
T Safety, Industrial Education
W Wood Technology

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

Prior to registration for graduate level vocational certification courses, the student shall be classified as a senior or have an earned bachelor's degree, and be required to complete additional assigned readings, term papers, and graduate projects

502 Applied Techniques in Materials and Processes. (2-2) Cr 3 Prereq 10 credits in industrial education Classroom simulation of industry and study of the production process Students participate in a profit-making corporate structure involving manufacture of hard goods. Exploration of management, systems, controls, financing and personal

528 Human and Public Relations for Industrial and Technical Education. Prereq 340 Identifying a plan of public relations for industrial and technical education, analysis of publics that need to be reached, effect of human relations on public relations, criteria for evaluating public relations

532 Industrial Arts and Technology for Children. (2-2) Cr 3 Prereq 10 credits in elementary education or industrial education Development of elementary school programs in industrial arts and technology. Identification of psychomotor and developmental factors in children related to tool and material manipulation Integration of technology concepts into the elementary school curriculum. Foundations of skills and concepts to facilitate concept mastery in other disciplines

550 Industrial and School Shop Safety. (3-0) Cr 3 Prereq 310 Safety as it pertains to the Industrial arts and Technology. Emphasis on safety procedures OSHA and INDOT regulations and the standards as required by OSHA and INDOT

554 History and Philosophy of Industrial Education. (3-0) Cr 3 Prereq 312 An evaluation of educational and industrial thought Historical and philosophical development of industrial education to the present, trends and implications

555 Administration and Supervision of Industrial Education (3-0) Cr 3 Prereq 410 Administration, supervision, curriculum development, selection of staff, and public relations. Evaluating administrative and supervisory efforts, program modification. Field trips to schools and industrial plants

557 Organization and Management of the Industrial Education Laboratory. (3-0) Cr 3 Prereq 410 Principles and practices involved in the planning, organization, and management of the school shop, responsibilities of the school administrator and teacher, basic principles of planning, selection and purchase of machine tools, equipment and materials, maintenance, storage and control of tools and equipment, managing the shop for effective work

561 Advanced Topics in Power and Energy. (2-4) Cr 4 Prereq 442 Development of integrated systems utilizing fuels, electrical components, and equipment. Experimentation in alternative energy systems, system evaluation for efficiency and cost-effectiveness Utilization of computers in real-time system monitoring and control of power production systems

580 Advanced Topics in Graphic Communications. (2-4) Cr 4 Prereq 425 Exploration of computer graphics Advanced design and drawing applications Integration of aesthetic, function, cost, and human factors specifications in product design, evaluation of product design Opportunity for individual creativity and specialization in an area of graphics

581 Advanced Topics in Materials and Processes. (1-4) Cr 3 Prereq 580 Utilization of industrial materials including wood, metals, plastics, and ceramics, use of automation in manufacturing and quality control Opportunities for specialization in the area of materials and processes

590 Special Topics in Industrial Education. Cr 1-4 Prereq Graduate classification in industrial education Special topics in industrial education administration, curriculum, evaluation, research, history, safety, technical education, etc

593 Workshop in Industrial Education. Cr 1-0 Cr 3 Prereq 15 credits in industrial education

599. Creative Problem. Cr 1-3 A discipline-related problem Area to be identified and completed under the direction of the program adviser. Three credits required for all nonthesis master's degree students

Courses for Graduate Students, major or minor

615 Seminar. Cr 2-3 Prereq Credit or classification in 401

644 Futuristics in Industrial Education. (3-0) Cr 3 Prereq Graduate classification, permission of instructor Critical analysis of future changes in the role and requirements of education Future alternatives for industrial education with relationship to society, education, and technology

652 Program and Student Evaluation. (3-0) Cr 3 Prereq 491 Developing basic concepts of evaluation Techniques for evaluating student personnel, facilities, programs, staff, and other educational resources
Industrial Vocational-Technical Education (IVTE)

Courses primarily for Undergraduate Students

300 Occupational Competency Cr up to 30 semester hours. Prereq Approval of department head, enrolled in B.S. degree (IVTE) and have planned program leading to full-time employment, have met the industrial experience requirement for vocational approval, have junior classification, have completed 10 semester credits at this point in receiving credit for occupational competency. Competency in the following occupational clusters is determined through completion of oral, written, and performance examinations. See Industrial Education Department Undergraduate Test Program guidelines for additional information.

A Automotive and Power Mechanics
B Building Trades
C Commercial Art
D Drafting and Graphics
E Electricity-Electronics
F Metal Trades

380 Orientation to Teaching Industrial Vocational Technical Education Programs. (3-0) Cr 3 Orientation to industrial vocational teacher education with basic skills necessary for the beginning teacher and experiences in teaching IVTE subjects, evaluation and laboratory management, career and instructional materials development

381 Foundations of Industrial Vocational Technical Education (3-0) Cr 3 Prereq 380 Development and philosophy of industrial vocational-technical education, career development practices, federal and state legislation, State programs, divisions, types of programs, the organization, administration, and financing of secondary and post-secondary industrial vocational-technical education programs

382 Occupational Analysis and Course Construction in Industrial Vocational-Technical Education. (2-0) Cr 2 Prereq 380 Course of study development based on occupational analyst and career needs. Compilation, arrangement, and limitation of instructional materials

383 Techniques of Teaching Industrial Vocational-Technical Education. (3-0) Cr 3 Prereq 380 Teaching processes, methods of presentation, testing, lesson planning, orientation of instruction, execution of instruction, and instructional materials

384 Facility Planning, Organization and Management of Industrial Vocational-Technical Education. (4-0) Cr 4 Prereq 380 Principles, practices and problems in planning, organizing and managing schools and laboratories in industrial vocational-technical education

490 Independent Study in Industrial Vocational-Technical Education. Cr 1 to 5 Prereq Junior classification, quality-point average of 2.5 or more for two preceding quarters

A AdultIVTE
B Vocational-Technical
C CurriculumIVTE
D EvaluationIVTE
E Special NeedsIVTE
F Instructional MaterialsIVTE
G Library ProblemsIVTE
H Technical TrainingIVTE
J Administration

491 Evaluation in Industrial Vocational-Technical Education. (2-0) Cr 3 Prereq. 380 Instruction, instructor, student, and program evaluation with the purpose of improving the total effectiveness of instruction

492 Coordination and Administration of Industrial Vocational-Technical Education. (3-0) Cr 3 Prereq Principles of organization, coordination, and administration of cooperative education with business and industry to provide part-time, on-the-job training, and career development experience

493 Human and Public Relations for Industrial Vocational Technical Education. (3-0) Cr 3 Prereq 380 Identifying, administering, and supervising a plan of human and public relations for industrial vocational and technical education, analysis of publics that need to be reached, effort of human relations on public relations, criteria for evaluation

Courses primarily for Graduate Students, major or minor, open to qualified undergraduates.

510 Techniques of Teaching Vocational and Technical Education. (2-0) Cr 2 Prereq 380 Teaching processes, methods of presentation, lesson planning, and instructional organization

514 Foundations of Vocational and Technical Education. (2-0) Cr 2 Prereq 380 Principles of organization, coordination, and administration of cooperative education with business and industry to provide part-time on-the-job training for students

519 Occupational Analysis and Course Construction. (2-0) Cr 2 Prereq 510 Course of study development based on occupational analysis. Compilation, arrangement, and limitation of instructional materials

522 Evaluation in Industrial Vocational-Technical Education. (2-0) Cr 2 Prereq 510 Theory and evaluation of methods unique to vocational-technical education

524 Conference-Leading Techniques. (2-0) Cr 2 Prereq 510 Conference procedures and techniques as applied to teaching and advisory committee functions

525 Coordination of Cooperative Education. (2-0) Cr 2 Prereq 510 Principles of organization, coordination, and administration of cooperative education with business and industry to provide part-time on-the-job training for students

530 Administration and Leadership in Industrial Vocational Technical Education. (3-0) Cr 3 Prereq 514 Administration and leadership styles, theory of administration, and applications to vocational-technical education

536 Legislative and Financial Aspects of Industrial Vocational-Technical Education. (3-0) Cr 3 Prereq 514 Legislative and financial guidelines and practices at the local, state, and federal levels as they relate to secondary and post-secondary vocational programs, students, and staff

549 Internship in Industrial Vocational-Technical Education. (arr) Cr 1 to 14 Prereq 10 hours in industrial education. Emphasis on full experience in industrial vocational-technical education, administration-supervision, special needs, curriculum-instruction, and evaluation-research

590 Special Topics in Industrial Education. Cr 1 to 5 Prereq Graduate classification in industrial education

600 Occupational Safety. (3-0) Cr 3 F Prereq 201 Introduction to industrial accident prevention as it relates to health and safety

601 Highway Transportation System-Drivert Task Analysis. (2-1) Cr 3 F The highway transportation system with specific treatment of the vehicle operator tasks

610 Accident Investigation and Records. (3-0) Cr 3 S Prereq 201 The procedure for investigating causes of work and motor vehicle accidents

315 Handling of Products and Hazardous Materials. (3-0) Cr 3 S Prereq 202 The manual and mechanical handling procedures for products and materials and the storage of hazardous chemicals

317 Theory and Practice of Multi-Car and Behind-the-Wheel Instruction. (1-4) Cr 3 F Prereq 201 Operational procedures of an off-road driving facility and the construction and use of the behind-the-wheel instruction for beginning drivers

330 Legal Aspects of the Occupational Safety and Health Acts. (3-0) Cr 3 S Prereq 202 Legal implications of legislation as it applied to health and safety in the workplace

360 Fire Protection and Prevention. (3-1) Cr 3 S Prereq 202 Causes and prevention of industrial fire accidents

401 Perception and Safety. (3-0) Cr 3 S Prereq 201 Accidents and their causes relative to the five human senses to ascertain appropriate methods

415 Theory and Practice of Classroom Instruction. (3-0) Cr 3 S Prereq 371 Investigation of content methodology, and evaluation of classroom instruction. Emphasis includes observation and actual teaching experience

416 Theory and Practice of Simulation and Behind-the-Wheel Instruction. (2-4) Cr 4 S Prereq 371 Operational procedures of a driving simulator lab and behind-the-wheel instruction for beginning drivers

420 Motorcycle Safety Instruction. (1-4) Cr 3 F Prereq 201 To prepare instructors for teaching a beginning motorcycle rider course including classroom and on the motorcycle

430 Safety Internship. Cr 1 F to 4 S Prereq 201, 416 or 447. The practical learning experience as a component of a student's formal education in occupational and traffic safety education

470 Industrial Hygiene. (3-0) Cr 3 F Prereq 202 Health-related problems found in an industrial setting. Toxic chemicals, ventilation and noise problems

471 Instrumentation for Industrial Hygiene. (1-4) Cr 3 S Prereq 470 The use and calibration of instruments to measure the quality and quantity of contaminants in the work environment

490 Independent Study in Occupational and Traffic Safety Education. Cr 1 to 4 F Prereq 201 provides a mode of learning to meet individual needs of a student in the field of accident prevention. Prereq 201, quality-point average of 2.5 or more

A Administration
B Legislation
C Curriculum
D Data Analysis Research
E Occupational Safety
F Technical Writing
G Traffic

Courses primarily for undergraduate students, open to qualified undergraduates

500 Administration of Accident Prevention Programs. (3-0) Cr 3 F Prereq 201, 315. Procedures for organizing and administering an occupational and traffic safety education program

515 Curriculum Development for Safety Programs. (3-0) Cr 3 S Prereq 315 or 415. Theory and principles of content selection, methodology, and evaluative techniques applicable to traffic and occupational safety

541 Safety Symposium. (1-0) Cr 1 F Prereq 9 hours in safety education. A broad overview of the entire field of safety through outside readings by the classroom participants

560 Special Topics in Safety Education. (Arr) Cr 1-3 Applications of safety education principles to special topics such as motorcycle, bicycle, industrial, household, traffic, etc. Individualized instruction in area of major interest and concentration
Industrial Engineering

Keith L. McRoberts, Chair of Department

Professors: Berger, Cowles, David, Griffen, McRoberts, Montag, Moore, C. E. Smith, G. W. Smith, Tamashunas, Vaughn

Emeritus Professors: Hempstead, Hilliard, Kierschmidt, Squires, Walkup

Associate Professors: Adams, Bara, Bloss, Carn, Even, Harrison, Hendricks, Lamp, Love, Malstrom, Meeks, Mohr, Park, Watkins

Assistant Professors: Eichner, Grant, Spabken, Theile

Undergraduate Study

For undergraduate curriculum in industrial engineering leading to the degree, Bachelor of Science, see College of Engineering, Curriculum and Methods.

The industrial engineering curriculum prepares persons who have strong aptitudes in engineering and a potential capacity for management for challenging careers in planning, controlling, designing, and managing complex industrial organizations for efficient operation.

Professional services performed by industrial engineers include: line management, facilities planning, cost and economic analysis, safety engineering, industrial relations, quality control and reliability, inventory and production control, facilities and methods design, work measurement, operations research, information systems design, technical sales, and personnel supervision.

The curriculum includes a thorough foundation in the physical, mathematical, and engineering sciences, analysis, synthesis, and design. Since the industrial engineer deals with people, courses in social and humanistic subjects are included. This foundation prepares the graduate for positions in industry, government or graduate work in any of the specializations described in the section of graduate study. The curriculum is normally completed in four years.

A five-year cooperative program is available in the Industrial Engineering Department. See Cooperative Programs, College of Engineering.

Graduate Study

The department offers work leading to the degrees of Master of Engineering and Master of Science with majors in industrial engineering and engineering valuation, the degree of Doctor of Philosophy with major in engineering valuation, and minor work to students taking major work in other departments. Graduate work is designed to improve the student's ability in the professional practice of industrial engineering and to develop research capability.

The prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution.

With the help of a program of study committee, a graduate student designs an educational program in areas within industrial engineering and engineering valuation. Typical areas of concentration include engineering economics, capital budgeting, management science, management and regulation of public utilities, systems analysis and control, production systems analysis, engineering economics, management information systems design, safety engineering, human factors, industrial relations, and legal aspects of engineering. Some specialization in operations research leading to a Master of Science degree is co-offered with the Department of Statistics.

The department also participates in the following interdepartmental programs: Industrial Administrative Sciences, Industrial Relations, Energy Systems Engineering, Technology and Social Change and Transportation Planning (See Index).

Open to graduate students for minor credit only:

301, 312, 333, 341, 374, 375, 404, 407, 421, 423, 424, 425, 441, 443, 462

Courses Primarily for Undergraduate Students

100. Technical Lecture (1-0) Cr. R. S. Lectures and conferences develop the student's ability in the professional practice of industrial engineering and engineering valuation.


250. Introduction to Industrial Engineering (2-3) Cr. 2 F S Prereq. Main 165. Introduction to the design and control of production systems: economic plant location and layout, work design and measurement, production and inventory control, critical path scheduling.

274. Ergonomics in Work System Design (2-0) Cr. 2 F S Prereq. Using the ergonomics approach in physical and psychological aspects of workplace and task design and development. Investigation of basic human physical and physiological limitations, legislation, worker protection, workplace design, and environmental stress from heat, noise, vibration, and illumination in person-machine systems.

293. Seminar (1-0) Cr. R. F. Required of second semester sophomore students. Required of transfer students in the first semester after transfer to the Industrial Engineering Department.

298, 498. Cooperative Education Cr. R. F S. S. Required of all cooperative education students. Prereq. Permission of department chairman. 298 Work periods for sophomores in a fully integrated program. 498 Work periods for juniors and seniors. Students must register for these courses prior to commencing each work period.


312. Industrial Operations Research (4-3) Cr. 4 F S Prereq. 259, 290, Math 266. Credit or classification in Stat 231. Concepts, analytical techniques, optimization techniques, and applications of operations research to industrial engineering. Construction and optimization of models for industrial systems using linear programming, queuing theory, and use of problem-oriented languages such as MPS, GPSS, and FORTRAN in solving problems.

333. Computer Graphics (2-0) Cr. 3 F S. Prereq. Com S 172 or 112. Techniques for graphical machine communications. Use of available facilities: Graph plotting, two-dimensional and three-dimensional applications. Requirements and applications for interactive graphics communications.

341. Material and Project Control (3-0) Cr. 3 F S Prereq. 317. Analysis of inventory and sequencing and scheduling problems in the control of material flows. Application of linear programming and control techniques such as PERT and PERT/COST are included. Construction of mathematical models, use of heuristic techniques, and understanding key control languages such as FORTRAN in solving problems.

350. Entrepreneurship for Engineers (2-0) Cr. 2 S Prereq. Senior classification in engineering. An introduction to and guidelines for those students interested in private enterprise. Includes the organization of an engineering business venture, personnel and labor management, financial ratios and policies, forms of ownership, market analyses, etc. Case studies, outside readings, and guest speakers.

352. Health Care Management Engineering (3-0) Cr. 3 S Prereq. 250 or 375 and Math 165. Stat 105. Hospital organization and alternative health care delivery systems. The functions of various hospital departments and their productivity measures, the principles of hospital management and engineering applications, various case studies in use of industrial engineering in health care fields.

361. Industrial Quality Control and Inspection (3-0) Cr. 3 F S Prereq. 250. Stat 231. Techniques for obtaining measurements on industrial products and the statistical treatment of data to assist in quality control. Project involving the design of quality systems.


375. Industrial Organization and Work Analysis (3-0) Cr. 3 F S Prereq. Junior classification in engineering. Study of the organization, flow and levels in industry, major industrial organizations, types of organizations. The principles and methods of production control, inspection, warehouse systems, cost control, with special emphasis on work analysis, methods and measurement.

393. Industrial Inspection Trip 2 R F S Prereq. Junior classification in engineering. On-site visitation and inspection of various industrial facilities to gain background on various industrial functions and the role of the industrial engineering student. Includes participation in field work in areas such as research, production, and operational analysis.

404. Engineering Economy (3-0) Cr. 3 F S Prereq. Econ 201. Acc 301. Application of fundamental economic principles to engineers. Economic decision-making in project development, and managing industrial projects.


420. Engineering Sales (2-0) Cr. 2 R F S Prereq. 304, 424, and either 480 or Mgmt 315. Requirements for entry into field of sales engineering. The relationship of sales engineering to other fields such as industrial administration, purchasing, and marketing.

421. Safety Engineering (2-0) Cr. 2 F S Prereq. 250 or 375. Principles of hazard identification and accident prevention in the worksite. Hazards and their control to reduce risk of accident/illness. Incentives to provide a safe working environment including economic and legal aspects.

423. Industrial Compensation (2-0) Cr. 2 F S Prereq. 250 or 375. Principles of wage determination. Exercises in gift design. Understanding and administering compensation systems utilizing job evaluation, performance rating, and wage survey incentive programs and employee benefit packages.

424. Human Resource Management. (1-0) Cr. 2 F S. S Prereq. 250 or 375. Employer-employee problems and approaches to their solution utilizing behavioral science concepts. Emphasis the
425. Socio-Technical System Design. (2-2) Cr 3 F
Prep: Preq: 424. Design of systems recognizing
socio-technical impact on job design, productivity,
organization planning, and change. Emphasizes
developing work environments concerned with quality
of work life.

441. Industrial Engineering Design. (3-6) Cr 5 F, 373, 372, 404. Production planning and design of
physical facilities for processing including site
selection, material handling, equipment specification
and layout. Design of plant and maintenance Design of
budgetary and cost controls for facility

443. Industrial Materials Handling. (2-2) Cr 2 F Preq:
373, 312. Analysis and application of mobile, fixed path,
and sequential material handling equipment in
industrial processes. Material handling relationships
to packaging, warehousing, and physical distribution

482. Industrial Systems Engineering. (3-0) Cr 3 S
Preq: 209. Stat 211. Application of mathematical and
statistical techniques to the synthesis and
development of industrial engineering problems. Use of
computer methods for analyzing data and studying properties of
industrial systems.

480. Engineering Law. (3-0) Cr 3 F. Preq: Junior
classification. Introduction to jurisprudence, judicial
procedure, contract essentials and principles, torts, real
property, sales, agency, workmen's compensation, safety,
intellectual property.

490. Independent Study. Cr 1 to 5 each time elected
Preq: Senior classification, permission of instructor
independent study and work in the areas of industrial
engineering design practice, or research
A. Valuation, Planning and Engineering Economy
B. Human Resource Management
C. Industrial Engineering
D. Management System
E. Management Science and Operations Research
H On Honors

491. Professional Development. (1-0) Cr F

492. Advanced Engineering Economy. (3-1) Cr 2 or 3
or for students with 2 credits prerequisite and
vice versa) F Preq: 304 or 404. Advanced engineering
economics: analysis, forecasting, financial, legal, tax,
and other factors influencing managerial decisions
involving the expenditure of capital funds

505. Capital Expenditure Programming. (3-0) Cr 3 S
Preq: 209. Concept and current practice of capital
expenditure programming and budget. Factors influencing the
priority queues and the optimum-ration level of expenditures. Project
request, consideration, revision, screening, rejection,
postponement, or subsequent verification and feedback
processing. Planning and control of the capital
expenditure budget and sources of funds

506. Engineering Aspects of Public Utility Administration
(2-1) Cr 3 S. Analysis of legal, financial, and technical
problems arising from the regulation of service and rates,
the taxation, and the operation of public utilities

507. Depreciation Estimates. (3-0) Cr 3 Alt S. offered
data. Technique for the construction of survivor, probable life,
condition percent, and accrued depreciation curves for property groups. Analysis of the
effect of growing, declining, and stable properties on
depreciation estimates

509. Engineering Valuation Practice. (2-0) Cr 2 Alt S.
offered 1983. Preq: 407. Application of principles of
engineering valuation, including field work, preparation
and presentation of reports, valuation techniques,
security regulations, condemnation, sales, estate
settlements, and determining fixed capital costs

511. Operations-Research Concepts. (4-0) Cr 4 F
Preq: 407. Theory and development of operations-research concepts and techniques within
industrial contexts. Includes simplex method, networks,
dynamic programming queueing theory, inventory
theory, simulation, decision analysis, integer and
nonlinear programming

512. Queueing Theory and Applications. (2-0) Cr 2 S
Preq: 312 or 511 Development and use of
mathemathical models for the analysis of queueing
systems. Applications to service industries as well as
industrial types of situations. Steady state as well as
transient systems are included

514. Advanced Material Control. (3-0) Cr 3 S Preq:
341, 511, Stat 231 or 432. Scheduling theory for project,
flow, and shop systems. The synthesis of
scheduling. Allocation of work shop shop
program, and application of network theory and
queueing theory. Inventory systems, including both
deterministic and stochastic lot size models, for
simple and multimodality control of production materials
Constrained models. Computer analysis techniques

515. Management Science. (4-0) Cr 4 S Preq: 341 or
511. Management science project including proposal
preparation for industry or service problems. Final
report on project for implementation of research results

517. Design of Industrial Engineering Systems. (2-1) Cr
3 F Preq: 312 or 511, 404. Application of feedback
and dynamic concepts to industrial systems
Quantitative and simulation methods used to analyze
design effective systems for inventory, quality,
scheduling, etc. Making efficient use of all productive
resources

518. Digital Simulation Techniques. (2-3) Cr 3 F
Preq: Comp S 172, Stat 231 or 432. The simulation
of mathematically determinate and manufacturing
systems by digital computer. Use of
topological optimization algorithms that are
helpful in simulation. Competence is developed in
GPSS with an introduction to Simscript, GASP, and
GERT

527. Dynamics of Industrial Organizations. (2-2) Cr 3 S
Preq: 424. Advanced study of relevant current
behavioral science research offering insight and
understanding regarding the behavior of industrial
organizations. Development of the
knowledge of the effective, viable, and socially effective
work organizations

531. Sequential Process and Production Control (Stat
531) See Statistics

533. Reliability (Stat 533) See Statistics

534. Mathematical Programming I. (4-0) Cr 4 F
Preq: 511, Math 100, theory, and computational
aspects of simplex method. Duality treated theoretically and as a post optimality tool
Network and transportation problems Unconstrained
optimization involving convex and concave functions
using descent methods and Quasi-Newton methods

539 Game Theory (Econ 539, Stat 539) See Statistics

545. Advanced Facilities Design. (3-3) Cr 4 Alt F
offered 1982. Preq: 441. Design of facilities to provide
specialized manufacturing services. Considerations and
tool control applications for computer aided manufacturing
operations and industrial robots. Process sequence
design for state-of-the-art manufacturing operations

551. Industrial Engineering Concepts. (3-0) Cr 3 F
Preq: 209 or 373, Math 151. Development in
depth of theoretical and practical concepts of current
industrial engineering practice

552. Industrial Organization Theory. (2-0) Cr 2 S
Preq: 424, 551. Theoretical organization with the
purpose of explaining, predicting, and influencing
organization behavior. Requirements for design and
control of industrial organizations and their
components

560. Industrial Information Systems. (3-0) Cr 3 S
Preq: 209. Role of information systems in supporting
industrial operations such as manufacturing, personnel,
resource allocation, scheduling, and forecasting
Design and usage of file, economic, and
management-based decision processes in selection of
hardware and software for industrial applications. Data flow design in
Design of information systems

(2-0) Cr 2 Alt S. offered 1982 Preq: 375, 424
Evaluation of work measurement systems considering
repetitive and nonrepetitive, stopwatch use,
predetermined and developed, standard data, and work
sampling and operator log studies. Application to
industrial situations. Analysis of current literature

577. Human Factors. (2-2) Cr 3 F Preq: 274, Stat
231 or 432. Analysis of psychological factors affecting
human performance. Emphasis on applications of
human factors principles, measurement techniques,
and applications to practical design involving
safety, productivity, stress reduction, behavioral control,
and individual preferences. Laboratory work includes

581. Administrative and Tax Law Aspects of
Engineering. (3-0) Cr 3 F Preq: 480. Administrative
agencies, the administrative law that flows from these
agencies, and its interrelationship with industry, with
special emphasis on the substantive and administrative
effects of taxation

592. Intellectual Property and Product Liability
Aspects of Engineering. (3-2) Cr 2 F Preq: 480. To
familiarize the prospective manager with problems encountered in
the areas of patents, trademarks, copyrights, and
product liability

590. Special Topics. Cr 1 to 5 each time elected
Preq: Independent study, permission of instructor
for planning and design, or current advances and innovative approaches to industrial
eengineering design, practice, and research
A. Valuation, Depreciation, and Engineering Economy
B. Human Resource Management
C. Industrial Engineering
D. Regulated Industries
E. Management Science and Operations Research

Courses for Graduate Students, major or minor

608. Depreciation Accountancy. (3-0) Cr 3 Alt S.
offered 1982 Preq: 507. Unit and group methods of
accounting for depreciation, reserve requirements
adjustment of depreciation rates and reserves,
classification of accounts, property accounting
methods Income tax regulations

624. Advanced Human Resource Management. (2-2)
Cr 3 S Preq: 425, 527 or 552. Critical study and
analysis of work design and organization structure for
increase productivity. Application of behavioral
sciences to design of work with concern for quality of
working life Legal and economic constraints included in

630. Mathematical Programming II. (4-0) Cr 4 S
Preq: 534 or Stat 541. Optimum conditions for
nonlinear constrained problems. Penalty methods
and barrier methods. Integer programming
including cutting planes, branch and bound and search
enumeration plus specialized algorithms and applications

515 Production System Philosophy. (2-2) Cr 2 F
Preq: 511, 551. An in-depth examination of the
philosophy, nature, and assumptions inherent in cases and
systems involving systems used to produce goods and services

519. Court and Commission Practice. (2-0) Cr 2 Alt F
offered 1982 Preq: 561A, 581, 608, 618B, 581
A. Utility rates, property valuation, and
depreciation. B. Legal relations in work to explore recent
developments

690. Advanced Topics. Cr 1 to 5
A. Industrial Engineering Research
B. Engineering Valuation Research

Industrial Relations

(Internedepartmental Program)

Paul M. Muchinsky, Chair, Supervisory Committee

Supervisory Committee: J. P. Mattila, R. P
Marratt, C. P. Morrow, C. E. Smith, J. M
Whitmer, W. F. Woodman

Work is offered for the degree Master of Science with a major in industrial relations. This is a
multidisciplinary degree offered under a
 cooperative arrangement by the departments of
Economics, Industrial Engineering, Political
Science, Psychology, and Sociology
Graduate students in industrial relations usually receive their undergraduate background in economics, business administration, industrial engineering, political science, psychology, or sociology. Admission is not restricted to students from these majors, however. Students entering industrial relations ideally should have a broad background in the social sciences.

The program in industrial relations is regarded as education for both professional practice and scientific inquiry. Through the Industrial Relations Center and its interdisciplinary faculty, facilities and opportunity exist for research of both a fundamental and applied nature on a variety of problems concerned with the world of people at work.

A student majoring in industrial relations will choose a major professor from the graduate faculty of the cooperating departments. The student's program of study will be developed with the guidance of an advisory committee selected by the student and the major professor, approved by the chairman of the Industrial Relations Supervisory Committee, and appointed by the dean of the Graduate College. Students may elect the thesis option (consisting of 30 semester-hour credits) or the nonthesis option (consisting of 36 semester-hour credits) which is open to all students. Regardless of which option is taken, all students must take the following core courses: Econ 445, 147, 474, 476, 478, Stat 401. For students enrolled in the non-thesis option, the research component of their degree program will be satisfied via the completion of a 3 credit creative component. For students enrolled in the thesis option, the research component of their degree program will be satisfied via the completion of 6 credit thesis. The balance of the program of study for students in either option will consist of electives from the recommended courses in the industrial relations curriculum. A minimum of two courses must be taken in three of the five departments comprising the program, with a maximum of four courses in any one department. A minimum of 12 semester credits must be taken from 500-level (or above) courses. In general, the degree program in industrial relations is designed to be as flexible as possible to support the student's own professional interest. Satisfactory completion of a final comprehensive oral examination is required of all students. As part of their graduate education, students enrolled in the non-thesis option have the option of enrolling in an off-campus internship program.


Institution Management

Marjorie M. McKinley, Head of Department

Professor: McKinley
Emeritus Professor: Augustine
Associate Professor: Brown
Assistant Professors: Finley, Frederiksen, Hostetler, Kelley, Robson, Walsh
Instructors: Baker, Burger, Clumine, Cooper, Culler, Dudley, Greiner, Huss, Hutchcroft, Johnson

Undergraduate Study

The department offers work for the degree Bachelor of Science in Home Economics, Curricula in foodservice management and in hotel and restaurant management, see Home Economics, Curricula in Foodservice Management and in Hotel and Restaurant Management. The curricula in institution management provide preparation for men and women interested in managerial positions in the institution foodservice and housing industries.

The curriculum in foodservice management is planned to provide men and women with a general education plus professional preparation for the management of foodservice organizations such as college and university residence halls and student unions, elementary and secondary schools, industrial plants, and office buildings. The curriculum prepares students for positions as administrative dietitians, foodservice managers, and foodservice directors.

The curriculum in hotel and restaurant management provides, in addition to a general education, basic work to prepare men and women for supervisory and executive positions in the hotel and restaurant industry. Principles of business management are presented, as well as fundamentals of foodservice and housing service.

Learning experiences are provided in the quantity food production and service facility of the institution management department. The food and household administration departments of the Memorial Union, university residence halls, school foodservice systems, and other approved establishments offer managerial experience to advanced students. A three- or four-day field trip to organizations related to the foodservice and housing industry is offered alternate years and will be a required part of the curriculum administered in institution management.

An option available to students enrolled in the Foodservice Management Curriculum is the Coordinated Undergraduate Program in Dietetics, which is offered jointly by the Food and Nutrition and Institution Management Departments. In this program, increased emphasis is given to the application of principles in the environment of the profession, classroom learning is provided concurrently with the application of principles. While completing the requirements for the B.S. degree, students completing this program meet the academic and experience requirements for membership in The American Dietetic Association.

Graduate Study

The department offers work for the degree Master of Science with major in management and minor work to students taking major work in other departments.

Work may be taken for the degree Doctor of Philosophy as required of departments offering work for this degree in home economics, engineering, economics, education, or other related areas.

The usual prerequisite to major graduate work is the completion of nine semester credits in institution management and six in food and nutrition, and fundamental preparation in accounting, chemistry, and microbiology. The exact requirements will depend upon the field of work the student expects to pursue.

Open to graduate students for minor credit only. 434, 435, 437, 438, 450, 460, 470

Courses Primarily for Undergraduate Students

287. Introduction to Management in Selected Occupations (2-0 Cr 2 F S) Introduction to management concepts and principles with application to various occupations related to home economics. Specific applications of these concepts are presented by representatives from the occupational areas.

380. Quantity Food Production Management. (2-0 Cr 2 F S) Prereq F N 407 or 408, 214, concurrent enrollment in 380L. Principles of management in quantity food production with emphasis on methods of preparing food in quantity, quality control, work methods, menu planning, sanitation and safety, and food cost control.

380L. Quantity Food Production Management Laboratory (0-0-2) or (0-0-2) Cr 1 or 2 F S S Prereq F N 407 or 408, 214, concurrent enrollment in 380, advance reservation with department required. Application of management in quantity food production through use of appropriate production and service methods.

400. Study Tour. Cr 1 F 0 Alt S, offered 1982. Prereq Junior or senior institution management classification. Study tour of quantity foodservice and house administration units and related industries. Offered on a satisfactory-labor basis only.

404. Seminar (0-2) Cr 1 S Prereq Senior classification.


435. Layout and Equipment. (2-2) Cr 3 F S Prereq Credit or classification in 380, 380L. Food facilities planning and design. Selection of equipment with emphasis on materials, construction, and specifications. Field trips required. Fee.

436. Experience in Foodservice Management. (0-6) Cr 2 S Prereq Classification in 434, 435, admission to the Coordinated Undergraduate Program in Dietetics. Supervised experience in foodservice management, with emphasis on areas related to food purchasing and layout and equipment.

437. Automated Foodservice Information Systems. (2-0) Cr 2 F S Prereq 434. Application of computer-assisted management in foodservice organizations through the use of an educational simulation model. Interpretation of computer printouts with emphasis on use of data by management in planning and controlling functions.

438. Personnel Management in Institutions. (3-0) Cr 3 F S Prereq Credit or classification in 380, 380L. Functions of management. Principles of personnel organization and management as applied to foodservice and lodging systems. Principles and practices related to personnel recruitment, selection, training, employee-employer relations, and wage administration. Union and government considerations. Labor and cost controls.

450. Hotel and Restaurant Accounting. (2-0) Cr 2 Alt F, offered 1881. Prereq 287, 289. Accounting procedures applicable to hotels, restaurants, and clubs.

452. Emphasis on hotel front office and uniform systems of accounts. For students majoring in hotel and restaurant management.
Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500. Short Course Cr arr

580. Quantity Food Development, (1-3) Cr 2 S Prereq 380 and 380L, advance reservation with department required. Experimental approach to quantity food production Development of formulas within parameters of time, institution equipment, and ingredients Emphasis on sensory analysis

585. Catering, (1-3) Cr 2 F Prereq 380, 380L, advance reservation with department required Management, preparation, and presentation of special foods Management of special foods Production of foods for special functions Emphasis on historical and cultural background of special foods Creative experiences with gourmet foods

590. Special Topics and Workshops, Cr arr Prereq Permission of department head A Foodservice Management B Housing Services Management C General

Courses for Graduate Students, major or minor

601. Decision Optimization in Institution Management (4-0) Cr 4 S Prereq 6 semester credits in institution management including 437, college mathematics Categorical regression and correlation, decision theory Emphasis on application of decision theory in institution foodservice and housing systems, using quantitative methods and models to optimize decisions Use of computer as a tool for data analysis

604. Seminar, Cr arr F S SS

609. Administration Problems, Cr arr Prereq Permission of department head Consideration of advanced administrative problems Case studies in foodservice and housing departments of Iowa State University, Memonia, and other establishments

International Studies

K H Frederich, Chair, Advisory Committee


The international studies programs are designed for students who are interested in international studies as a field of academic study and for those interested in training for employment overseas in the foreign service or other government agencies, in foreign activities of business and industry, or in technical aid and development programs in any one of five fields Agriculture, Education, Engineering, Home Economics, or Sciences and Humanities

Students in Agriculture, Education, or Sciences and Humanities are required to enroll in departments of Iowa State University's residence halls Memonia Union, or other approved establishments For students majoring in hotel and restaurant management or foodservice management

483. Lodging Management Experience (2-0) Cr 3 F Prereq 438, 450, 450, E & S 220, advance reservation with department required Analysis and interpretation of management functions Experience in departments of Iowa State University residence halls or other approved establishments For students majoring in hotel and restaurant management

486. Comprehensive Professional Management Experience, Cr var S Prereq 492 or 493, advance reservation with department required Analysis and interpretation of management functions Experience in departments of Iowa State University residence halls or other approved establishments For institution management students

490. Independent Study, Cr arr Prereq Permission of department head A Quantity Food Production B Organization and Management C General D Housing E Honors

II. U St 430. Seminar in International Studies, (3-0) Cr 3 S Capstone seminar required of majors in international studies For juniors and seniors only Total 3 cr

III. Language. A student majoring in international studies must complete two years in one foreign language. If only shorter offerings of a language are available, the chair of the international studies advisory committee may permit a student to substitute course work from Group IV below for language credits In no instance may a student be permitted to take less than one year of one foreign language None of the language credits may be counted toward the fulfillment of general education requirements Students whose first major is in foreign languages and literatures may fulfill the international studies language requirement by either taking two years of a second language or substituting 16 credits of course work from Group IV below

Students who choose Area Studies (B courses) for their international studies major should choose an appropriate area language to fulfill the international studies language requirement They should choose an area language as well for their second language if their first major is a language For example, students studying Western Europe will choose French, German, Italian, Portuguese, or Spanish as the required international studies language Students already majoring in one of the above courses may choose one of the others for the second language. Students choosing Latin America will choose Spanish or Portuguese as the required international studies language Students already majoring in one of these areas may choose the other as the second language

Total 16 cr

IV. General Courses and Area Studies. A student must take a minimum of 18 credits selected from at least three disciplines (Section A courses) or area studies (Section B courses) with at least 6 credits in any one discipline or area Students with first majors in disciplines listed in Section A may not select courses offered by their first major department to fulfill international studies requirements

Total 18 cr

A. General Courses in International Studies

Anthropology


Business Administration

International Business Management — Mgmt 414 (3 cr)

Economics

Economic Development and Transformation of Agriculture in Developing Countries — Econ 535 (3 cr.)
International Trade — Econ 555 (3 cr.)
International Finance — Econ 557 (3 cr.)
Agriculture and Food Policies and Programs — Econ 562 (3 cr.)

Geography (Earth Sciences)
Principles of Geography — Geog 100 (3 cr.)
Cultural Geography — Geog 324 (2 cr.)
Cultural Geography: Asia, Africa — Geog 325 (2 cr.)
Man and Land in Anglo-America — Geog 326 (2 cr.)
Europe — Geog 328
Summer Field Study — Geog 495 (4 to 6 cr.)

History
Introduction to Western Civilization — Hist 201, 202 (3 cr each)
Introduction to the History of Science — Hist 280, 281 (3 cr each)
Modern Military History — Hist 399 (3 cr.)
Introduction to the History of Technology and Engineering — Hist 294, 295 (3 cr. each)
International Business History — Hist 376 (3 cr.)
History of U.S. Foreign Policy — Hist 467, 468 (3 cr. each)
History of Agricultural Sciences and Technology — Hist 480 (3 cr.)

May also be taken under appropriate geographical area studies.

Journalism and Mass Communication
International Communication and the Foreign Press — Jl MC 440 (3 cr.)
Mass Communication in Developing Nations — Jl MC 545 (3 cr.)

Political Science
Introduction to Comparative Government and Politics — Pol S 241 (3 cr.)
Introduction to International Politics — Pol S 251 (3 cr.)
Politics of Developing Areas — Pol S 340 (3 cr.)
U.S. Foreign Policy — Pol S 358 (3 cr.)
International Law — Pol S 422 (3 cr.)
The Military and Politics — Pol S 448 (3 cr.)
Comparative Foreign Policy — Pol S 452 (3 cr.)
International Organizations — Pol S 453 (3 cr.)
Development Administration — Pol S 478 (3 cr.)
World Food and Development Assistance Politics — Pol S 481 (3 cr.)
Single-Party States — Pol S 543 (3 cr.)
Political Leadership and Elites — Pol S 547 (3 cr.)
Comparative Political Behavior — Pol S 549 (3 cr.)
International Relations Theory — Pol S 559 (3 cr.)
Special Topics: Comparative Government — Pol S 580 (2-5 cr.)
Special Topics: International Relations — Pol S 5900 (2-9 cr.)

Religious Studies
Introduction to World Religions — Relig 250 (3 cr.)

Sciences and Humanities
Cross-cultural Explorations — Introduction to Third World Cultures — S-H 230 (3 cr.)

Sociology
Sociology of Language (Sociolinguistics) — Soc 405 (3 cr.)
Societal Change and Development — Soc 411 (3 cr.)
Adoption and Diffusion of Innovations — Soc 415 (3 cr.)

University Studies
Introduction to World Food Problems — U St 241 (2 cr.)
Technology International, Social, and Human Problems — TSC or U St 341 (3 cr.)
Seminar in Technology and Social Change — The International Dimension — TSC or U St 440 (1 cr.)
Independent Study — International — U St 490 (cr var)
Independent Study Technology and Social Change — TSC or U St 490F (cr var)
Technology and Social Change in Foreign Cultures — TSC or U St 541 (3 cr.)
World Food Issues — TSC or U St 542 (3 cr.)
Special Topics: Technology and Social Change — TSC or U St 590F (cr var)
Seminar in Technology and Social Change — TSC or U St 640 (1-3 cr.)
Foreign Study — U St 437 (cr var)

B. Area Studies
Africa and the Middle East
Introduction to African History — Hist 211 (3 cr.)
Archaeology of Africa — Anth 334 (3 cr.)
Peoples and Cultures of the Old World — Afric — Anth 324 (3 cr.)
Peoples and Cultures of the Old World Near East — Anth 324 (3 cr.)
Introduction to African Politics — Pol S 347 (3 cr.)
Society and Politics of Israel — Pol S 349 (3 cr.)
Development in African Politics — Pol S 447 (3 cr.)
Recent Francophone Literature of Africa and the Caribbean — Frnc 210 (3 cr.)

Asia
Peoples and Cultures of the Old World — Asia — Anth 324 (3 cr.)
Peoples and Cultures of the Old World — Oceania — Anth 324 (3 cr.)
Introduction to Chinese Civilization — Hist 207 (3 cr.)
Introduction to Japanese Civilization — Hist 208 (3 cr.)
History of Modern China — Hist 336, 337 (3 cr. each)
Modern Japanese History — Hist 436 (3 cr.)
Ways of Enlightenment, Hinduism & Buddhism — Pol S 341 (3 cr.)
Politics of the People’s Republic of China — Pol S 342 (3 cr.)
Asia in World Politics — Pol S 451 (3 cr.)

Latin America
Contemporary Latin-American Cultures — Anth 323 (3 cr.)
History of Latin America — Hist 340, 341 (3 cr each)
Survey of Culture and Literature of Hispanic World — Spain 321, 322 (3 cr each)
Latin American Government and Politics — Pol S 343 (3 cr.)
The U.S. and Latin America — Pol S 443 (3 cr.)
History of Mexico — Hist 441 (3 cr.)
Asia in Politics — Pol S 451 (3 cr.)
Luso-Brazilian Civilization and Culture — Port 321, 322 (4 cr. each)
Trends and Major Figures in Literature of Spanish America from Colonial Times to Independence — Span 454 (3 cr.)
Trends and Major Figures in Literature of Spanish America from Post-Independence to the Present — Span 455 (3 cr.)

Russia and Eastern Europe
Russian Civilization — Rus 321, 322 (3 cr each)
History of Russia — Hist 421, 422 (3 cr. each)
Modern East Central Europe — Hist 426 (3 cr.)
Government and Politics of the Soviet Union — Pol S 444 (3 cr.)
Soviet Foreign Policy — Pol S 457 (3 cr.)

Western Europe
Peoples and Cultures of the Old World — Europe —Anth 324 (3 cr.)
Archaeology of Europe and the Near East — Anth 426 (3 cr.)
French Civilization — Frnc 321, 322 (3 cr each)
German Civilization — Ger 321, 322 (3 cr each)
Spanish and Ibero-American Civilization — Span 321, 322 (3 cr each)
History of Medieval Western Europe — Hist 405, 406 (3 cr. each)
Contemporary Europe — Hist 411, 412 (3 cr each)
European Society in the Age of Enlightenment — Hist 416 (3 cr.)
European Society and the Industrial Revolution — Hist 417 (3 cr.)
French History — Hist 419 (3 cr.)
History of Modern Germany — Hist 424 (3 cr.)
Medieval England — Hist 427, 428 (3 cr each)
History of the Family in the Western World — Hist 384 (3 cr.)
Modern England — Hist 430, 431 (3 cr each)
Science and Religion in Hist 323 (3 cr.)
History of England — Hist 432, 436 (3 cr each)
Medieval and Renaissance Italy — Hist 407 (3 cr.)
Europe, 1500-1648 — Hist 408 (3 cr.)
19th Century Europe — Hist 410 (3 cr.)
European Intellectual History — Hist 414 (3 cr.)
World Economic History — Hist 381 (3 cr.)
U.S. Economic History — Hist 382 (3 cr.)
British Politics — Pol S 345 (3 cr.)
Governments of Western Europe — Pol S 346 (3 cr.)
Europe — Geog 328 (3 cr.)
Western Religious Thought — Relig 365 (3 cr.)
Contemporary Western Religious Thought — Relig 465 (4 cr.)
Overall Total 38 credits

International Studies in the College of Agriculture
Agriculture students are given two alternative programs for securing a secondary major emphasizing the international dimension. They can select the course of study described above or they can choose to follow the alternate program, International Agriculture. For information on the alternate program, see Index, International Agriculture

International Studies in the College of Engineering
Students in engineering participating in the International Studies Program remain in their professional curriculum and may use their electives for part of the International Studies Program requirements. An International Studies Program in Engineering shall have a minimum of 30 credits including University Studies 430 and a minimum of eight credits of foreign language. Interested engineering students should consult with their engineering advisers and the engineering faculty member of the International Studies Advisory Committee early in their residence at the University
**International Studies In the College of Home Economics**

A major in international studies is designed to provide students with a background for participation in government or agency programs, as well as to provide an opportunity to become oriented to national and international affairs as part of the responsibility of citizenship in its broadest sense.

Students in home economics with a major in international studies follow a curriculum that includes emphasis in social sciences — history, political science, economics, sociology, anthropology, psychology, and languages — in addition to home economics.

See Home Economics for the specific program.

**SPAN**

Student Project for Amtly among Nations (SPAN) is a program of carefully supervised foreign study. Participants spend one academic year promoting SPAN, planning research projects, and gaining background on the country to be visited. Most instances one year's study of an appropriate language is also required as part of the preparation year. Field studies require approximately eight weeks abroad during the summer following the year of preparation. During the academic year after the summer abroad, participants prepare a report on their investigation and devote further effort to the promotion of SPAN.

Total credits offered are 8-4 for preparation and the field study, four for the report and SPAN activity. Grades for the first 4 credits are determined by the group adviser. For the final 4 credits the grades are determined jointly by the group counselor and the group adviser. Classification may be in university studies courses or in an appropriate formal or special problems courses. Language credits are additional and grades are given by the language instructor.

Initiation of a SPAN project begins when at least 15 students request the chairman of the international studies advisory committee to (1) approve a country of the students' choice, (2) search for a faculty adviser, and (3) make arrangements for appropriate language instruction, if necessary.

Requests to initiate a SPAN project must be received at least 3 regular semesters (excluding summer sessions) before the summer in which students intend to go abroad.

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**Undergraduate Study**

The department offers work for the degrees Bachelor of Science and Bachelor of Arts with majors in general journalism, agricultural journalism, engineering journalism, home economics journalism, and science journalism. The department has full accreditation from the American Council on Education in Journalism with specific accreditation in news-editorial, broadcast news and advertising. Specialized coursework also is available to students interested in newspapers, magazines, public information and public relations, media management, international communication, visual communication and the teaching of journalism. Specific coursework is designed with the aid of the student's academic adviser in journalism and varies according to the student's background, experience, and career goals.

Students enroll in one of the following colleges: College of Sciences and Humanities (general journalism and science journalism); College of Agriculture (agricultural journalism); College of Home Economics (home economics journalism); College of Engineering (engineering operations with special program in engineering journalism).

All majors take a minimum of 30 credits of journalism courses, including a common core of courses and 2 credits of 489, Professional Media Internship. National journalism accreditation standards recommend that the number of journalism credits in the degree program be limited to approximately one quarter of total credits taken. See your adviser for further information.

**Cr. Degree Requirements**

<table>
<thead>
<tr>
<th>I. Basic Core Courses</th>
<th>II. Skills Courses</th>
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</thead>
<tbody>
<tr>
<td>2 Introduction to Mass Communication — JI MC 101</td>
<td>Students must select a minimum of 9 credits of 300-level courses according to their area of specialization. One of the courses selected must come from the following group: JI MC 355, 352, 360, 361, 370. The remainder may be selected from the above courses or from among other 300-level journalism courses.</td>
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<tr>
<td>8 Basic Reporting, Writing, Editing — JI MC 201, 202, 203</td>
<td>Students must select a minimum of 5 credits of 400-level courses in addition to those required in the basic core. One of these 400-level courses must come from the following group: JI MC 410, 431, 462. The remainder may be taken from the above courses or from among other 400-level courses except 490, 491, and 494. Students, in consultation with their advisers, should select courses which complement their area of specialization.</td>
</tr>
<tr>
<td>3 Law of Communication — JI MC 430</td>
<td>A minor, area of concentration, or second major in subject matter outside journalism also is required. See your adviser.</td>
</tr>
<tr>
<td>1 Professional Seminar — JI MC 491</td>
<td>Students majoring in other fields who elect a minor or area of concentration in journalism are invited to consult with journalism staff members for a recommended sequence of courses tailored to fit their particular needs and goals.</td>
</tr>
</tbody>
</table>
| 2 Professional Media Internship — JI MC 499 | **Graduate Study**

The department offers the degree of master of science with major in journalism and mass communication, and minor work to students taking major work in other departments.

For major work, a student must have a bachelor's degree in journalism or in a subject matter area which he or she wishes to combine professionally with advanced training in journalism and mass communication.

Admission of international students is limited to applicants with two types of backgrounds: (1) those engaged in communication or development in such fields as agriculture, home economics, and natural resources in their own country and whose employment indicates a need for specialized training; (2) those who can document at least two years of professional journalism or the teaching of journalism and who wish to improve their professional capability.

Open to graduate students for minor credit only: 410, 425, 430, 431, 436, 440, 450, 462, 464.

**Courses Primarily for Undergraduate Students**

| 101. Introduction to Mass Communication. (2-0) Cr. 2 | **101. Introduction to Mass Communication.** (2-0) Cr. 2 |
| F SS Communication models and their application to the mass media, the mass communication process, organization, characteristics and responsibilities of the mass media, media-related professional operations. For freshmen, sophomores only. |

201, 202, 203 Basic Reporting, Writing, Editing 201, 202, 203 English 105. Some typing proficiency, satisfactory performance on a standard English usage test administered by the Department, 201, 202, 203 concurrent registration in 202. News judgment and observation, organizing, writing and editing for the media. Sequence moves from simple information gathering, analysis, and writing techniques to polling, investigative reporting, and interpretive writing. 203 consists of writing for print or broadcast media.

| 225. Publicity and Public Relations. (2-0) Cr. 2 | 225. Publicity and Public Relations. (2-0) Cr. 2 |
| F SS Communication fundamentals, gathering material for mass media and sharpening writing skills by preparing stories for publication, operation, problems, and philosophies of media, using the media for publicity, public information, and public relations purposes. Not available to journalism majors. |

| 312 Fundamentals of Photography. (2-3) Cr. 3 | 312 Fundamentals of Photography. (2-3) Cr. 3 |
| F SS Introduction to visual communications. Camera and darkroom techniques. Evaluation of photography in terms of content, lighting, and pictorial composition. |

| 317 Communications Photography. (2-3) Cr. 3 | 317 Communications Photography. (2-3) Cr. 3 |
| F SS Introduction to use of still photography as a communications tool. Development of photographic skills in reporting, emphasis on photographic skills in exposure, development and printing for various reproduction processes. |

| 318 Advanced Photography. (2-3) Cr. 3 | 318 Advanced Photography. (2-3) Cr. 3 |
| S S Pre Req. 312 or 317. Others chooses of interests, scientific or documentary approach to development of advanced photographic perception and technique. Combines topical sessions with intensive study groups to explore trends in contemporary photography and to offer forum for critical analysis of student work. |

| 319 Motion Picture Technique. (5-3) Cr. 2 | 319 Motion Picture Technique. (5-3) Cr. 2 |
| F SS Basic techniques in shooting, editing, and presenting motion pictures as a means of communication, with special stress on 16mm format. |

| 320 Color Slide Photography. (3-0) Cr. 3 | 320 Color Slide Photography. (3-0) Cr. 3 |
| Use of color slide material to develop technical and aesthetic abilities at the intermediate photographic level. Multi-screen, multi-media lectures. Introduction to technique of slide-tape presentation. No lab. |
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Landscape Architecture

Albert J. Rutledge, Chair of Department

Professors: Dya, Harvey, Lane, Roberts, Rutledge, Sinatra

Emeritus Professor: Thomas A Barton

Associate Professors: Boon, Hightshoe

Assistant Professors: Anderson, Crandell, Grundman, Maechling, Olson

Undergraduate Study

For undergraduate curriculum in landscape architecture leading to the degree Bachelor of Landscape Architecture, see College of Design, Curriculum

Landscape architecture is a profession concerned with the quality of land use. It includes analysis of environmental factors and recommendations for preservation, and with other professions, the design, construction and maintenance of developed land areas. Among the types of land development normally included in professional practice are park and recreation areas, school grounds, institutional grounds, industrial sites, commercial sites, land subdivisions, and residential properties. The scale or scope of such projects varies from broad regional landscape analysis and planning to detailed design.

The curriculum, accredited by the American Society of Landscape Architects, provides the subject with an education which, combined with experience, is necessary for professional registration.

The curriculum is composed of a two-year preprofessional program and a three-year professional program

Admission of students into the professional program is subject to the approval of a faculty committee at the completion of the preprofessional program. Scholastic performance, aptitude, and personal development are the qualifications considered. Preprofessional credits must average at least 2.30 on a 4.0 marking system and this minimum must be maintained through graduation.

Graduate Study

The department offers work for the degree Master of Landscape Architecture with major in landscape architecture. Minor work is offered to students taking major work in other departments.

The degree Master of Landscape Architecture is granted upon the completion of two years of graduate study with a minimum of 40 credits in residence at Iowa State University. Satisfactory completion of 15 credits in residence. Students who are qualified by undergraduate work in landscape architecture at this institution. Students who are qualified by equivalent credits may be required to complete an additional year of study. The department also participates in the interdisciplinary minor in Housing (See Index)

Open to graduate students for minor credit only:
361, 462, 463.

Courses Primarily for Undergraduate Students

241. Basic Landscape Architecture Design and Graphics (1-9) Cr. 4 F. Prereq 6 credit of graphics. Design process, site analysis, programming, concept formation, form making, and communication presented in problems dealing with design of outdoor spaces. Various graphics and rendering techniques used in development and communication of landscape architectural projects, reports, and programs Fee

251. Fundamentals of Site Grading and Construction. (1-9) Cr. 4 S. Prereq. 241. Introduction to grading sites for residential and recreational use. Preparation of grading plans and construction drawings. Computation of earth volumes and land areas. Design considerations for walks, ramps, stairs, driveways, low walls, terraces, and storm water drainage systems Fee

271. Landscape Architecture History (3-4) Cr. 3 S. The development of landscape architecture from antiquity to modern times, with its relation to and influence of allied arts and professions. Lectures, readings, abstracts, reports

301 Planning Recreation Systems. (2-0) Cr. 2 S. Introduction to planning of sites for recreation. Techniques used in park and urban park system. Field trips Fee

309 Field Travel. Cr. 1 each time taken. F S. Prereq. Permission of instructor. Observation of the professional practice of landscape architecture in urban, rural, and natural areas. Offered on a satisfactory-fail basis only Fee

321 Plant Materials and Planting Design I (1-9) Cr. 4 F. Prereq. Bot 109 or Bot 207. Introduction to native grasses, forbs, trees, shrubs, and vines of the midwest used in landscape design. Emphasis on visual characteristics, cultural requirements, and ecological relationships. Planting design principles and techniques Field trips Fee

322 Plant Materials and Planting Design II (1-9) Cr. 4 S. Prereq. 321. Trees, shrubs, vines and herbaceous materials used in landscape design. Emphasis on function, visual, cultural and ecological aspects of introduced and horticultural varieties hardy in the midwest. Planting design principles and techniques Field trips Fee

335 Site and Landscape Design Studio (0-12) Cr. 4 SS. Prereq. 251, 322, 361. Site and planting design. Site and landscape design problems. Intermediate and advanced levels of site and landscape design. Field trips Fee

342 Intermediate Landscape Architecture Design. (1-9) Cr. 4 S. Prereq. 251, 322, 361. Practice in using social science information and communication techniques to understand human needs. Use of design process to arrive at information about human needs. Site and landscape design problems. Intermediate and advanced levels of site and landscape design. Field trips Fee

351 Landscape Inventory and Analysis. (2-0) Cr. 4 F. Prereq. 241. Basic land use and natural resource data used in the landscape planning and design process. Review of data characteristics, landscape analysis techniques, and applications to site and level regional problems. Identifying opportunities and limitation of landscape characteristic in planning and design for human use Fee

433. Advanced Site Planning and Planting Design. (1-9) Cr. 4 S. Prereq. 342. Solving complex site design problems with emphasis on interrelationships of utility, pedestrian and vehicular systems, building relationships, and the effect of natural systems. Integration of site design and landscape planning. Preparation of a complete development document with plans, schedules, details, and specifications. Field trips Fee

444, Landscape Architecture Seminar. (2-0) Cr. 2 F. Prereq. 443. Topics of concern to the professional landscape architect. Resume preparation, interviewing, employment, professional ethics, licensing requirements, continuing education.

452 Site Construction and Structures. (1-9) Cr. 4 F. Prereq. 342. Con. E. 241. Solving complex site construction problems including storm drainage, retaining walls, lighting, water and irrigation systems, mechanical and electrical systems, paving systems, wood technology, and structural theory. Design and preparation of contract drawings and specifications. Field trips Fee

453. Professional Procedures (2-6) Cr. 4 S. Prereq.
452. Preparation of proposals, contracts, other documents, and specifications for design services. Field trips Fee

462. Site Evaluation. (1-9) Cr. 4 S. Prereq. 342
361. Inventory, classification, and development of management objectives for visual components of landscape. Techniques for interpreting and communicating this information. Legal and procedural precedents. Field trips Fee

463. Comprehensive Landscape Planning (1-9) Cr. 4 F. Prereq. 443, 462. Physical design and arrangement of various land uses at regional and community scales. Design methodology and concepts communicated through graphic, written, and oral reports. Application of procedures which systematically analyze physical design impacts and define actions which could minimize the impacts. Field trips Fee

472. Landscape Architecture History and Preservation. (3-0) Cr. 3 F. Prereq. 271, 342. Theories, concepts, and methods of design influence upon physical environment. Research methods in preservation and restoration of the historic landscape. Lectures, readings, abstracts, reports

490. Independent Study. Cr. 1 to 4 F S S. Prereq. Permission of instructor. Investigation of an approved topic of special interest to the student. Election of course and topic must be approved in advance. Offered on a satisfactory-fail basis only:

A. Landscape Design
B. Planting Design
C. Construction
D. History
E. Landscape Planning
F. Urban Design
G. Graphics
H. Honors
I. Interdisciplinary Studies

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Seminar. (0-9) Cr. 3 F. Prereq. 463
541 Studio Workshop I. (0-9) Cr. 3 F. Prereq. 463
542. Studio Workshop II. (0-9) Cr. 3 F. Prereq. 541
590 Special Topics. Cr. 1 to 4 F S S. Prereq. Permission of instructor

A. Landscape Design
B. Planting Design
C. Construction
D. History
E. Landscape Planning
F. Urban Design
G. Interdisciplinary Studies

Courses for Graduate Students, major or minor

643. Studio Workshop III. (0-9) Cr. 3 F. Prereq. 542
644. Studio Workshop IV. (0-9) Cr. 3 F. Prereq. 643
650 Terminal Project. Cr. Var. F S S. Prereq. Permission of major professor. Comprehensive study and original development of a project selected by the student and approved by the department. Completed project must be submitted to and approved by a graduate faculty committee. Evidence of mastery of the principles of landscape architecture

Library

Warren B Kuhn, Head of Department

Profsessors: Gales, Kuhn, McIntee, Yates

Associate Professors: Cook, Gapen, Gherman, Lee, McKee, Morris, Orr, Pady, Peterson, Sage, Van De Voorde, von Godany

Assistant Professors: Bond, Flishbein, Foreman, Foulty, Fryer, Hobert, Jacobson, Kirk, Kraft, Lineweaver, Madison, Mathews, Mischo, Noland, Pafl, Perdue, M Roughton, Shonrock, Sickles, Wendell

Instructors: Conglio, Duke, Kline, Klaas, Osmus, Richardson, Rod, K Roughton, Tallman

Undergraduate Study

The Library offers instruction to increase facility in the independent use of libraries and books

Graduate Study

The Library offers a series of non-credit seminars to assist graduate students in the effective use of the Library's research resources. The seminars cover general materials as well as more specialized ones in the broad areas of the biological and agricultural sciences, the engineering and physical sciences, and the humanities and social sciences. For information and registration consult the Library Reference Department. Offered F S SS

Courses Primarily for Undergraduate Students

160 Library Instruction. (1-0) Cr. 5 8 weeks. F S

Prep: for students whose native language is not English. Completion of English 100 required. Use of libraries and books, including services offered and use of indexing services and reference materials. Offered on a satisfaction-fail basis only. To be taken during the freshman year or for transfer students during their first semester at Iowa State University

Linguistics

Supervisory Committee: Clyde Thogmartin, Chair, S. Gonzo, M. Lee, J. D. Lempers, M. Mason, W. R. Underhill, D. M. Warren

Undergraduate Study

The Linguistics Program is a cross-disciplinary program in the College of Sciences and Humanities designed to meet the needs of students interested in various aspects of language — its structure, history, varieties, meanings, and uses. Courses offered in eight different departments provide a multi-disciplinary approach to the study of human language.

Courses in linguistics serve as background for students interested in any career that involves working with language, such as anthropology, computer word processing, foreign language teaching, teaching English both as a first and as a second language, psychology, sociology, speech-language pathology and audiology.

In the College of Sciences and Humanities, courses in linguistics can be applied as electives or as part of the group requirements. They may also be used in a minor (see below), as one of the three component areas in a distributed studies major, or in an individual major.

Minors in linguistics are usually individually tailored to the interests of the student, who consults with the chairman or one of the members of the Linguistics Program Advisory Committee. All minors must have a minimum of 15 credits in linguistics, of which 6 must be in courses numbered above 300. All programs must include English 219 or Anthropology 221, and either Speech 271 or Foreign Languages and Literatures 491.

For information about using linguistics courses in a distributed studies major or an individual major, see Sciences and Humanities Cross-Disciplinary Studies.

Graduate Study

The following courses may be used in graduate programs with the approval of the student's program of study committee. Engl 420, 495B, F Lng 491, 492, Soc 405, and Sp 371

Primary Courses (Departmental)

Anthro 221. Linguistic Anthropology. See Anthropology
Anthro 490D. Independent Study. Linguistic Anthropology. See Anthropology
Anthro 590. Special Topics. See Anthropology
Anthro 596K. Advanced Topics. See Anthropology
Engl 219. Introduction to English Linguistics. See English
Engl 420. Applied English Grammar. See English
Engl 419. English Syntax. See English
Engl 422. History and Dialects of the English Language. See English
Engl 490B. Independent Study. Linguistics. See English
Engl 495. Teaching English to Speakers of Other Languages. Methods and Materials. See English
Engl 511. Introduction to General Linguistics. See English
Engl 512. Historical Linguistics and Language Classification. See English
Engl 514. Regional and Social Dialects of American English. See English
Engl 515. Phonology. See English
Engl 516. English Syntax. See English
Engl 517. Theoretical Foundations for Teaching English to Speakers of Other Languages. See English
Engl 589S. Seminar. Linguistics. See English
Engl 6900. Special Topics. Linguistics. See English
F Lng 491. Linguistics for Foreign Languages Teaching. See Foreign Languages and Literatures
F Lng 492. History of the Romance Languages. See Foreign Languages and Literatures
Phil 207. Introduction to Symbolic Logic. See Philosophy
Psych 413. Psychology of Language. See Psychology
Soc 405. Sociology of Language. See Sociology
Soc 540. Applied Sociolinguistics. See Sociology
Soc 546. Applied Sociolinguistics. See Sociology
Sp 225. Nonverbal Communication. See Speech
Sp 270. Speech and Hearing Science. See Speech
Sp 271. Phonetics. See Speech
Sp 275. Introduction to Communication Disorders. See Speech
Sp 305. Semantics. See Speech
Sp 371. Language Development. See Speech

Materials Science and Engineering

David R. Wilder, Chair of Department

Professors: Berard, Carlson, Chen, Dodd, Gschneider, Hunter, Kayser, Larsen, McGee, Patterson, Peterson, Scott, Smith, Trivedi, Verhoeven, Wechsler, Wilder

Associate Professors: Martin, Rossauer, Smyth

Undergraduate Study

Ceramic Engineering

For undergraduate curriculums in ceramic engineering leading to the degree Bachelor of Science, see College of Engineering, Curriculum.

Ceramic engineering deals with those products formed from natural and synthetic minerals, which are rendered durable by a process of heat treatment at high temperatures. These include most of the nonmetallic, inorganic, and metallic substances manufactured into electronic components, glass of all types, porcelain, enamels, abrasives, cements, ultrahigh temperature-resistant refractories, many materials of construction, and other similar products.

The ceramic engineer is concerned with the technical problems encountered in the research, development, control, production, and use of these products and materials and must also be well versed in the methods employed for forming, drying, and firing of ceramic raw materials. The ceramic engineer receives a well-rounded education to fit into research, production, equipment and plant design, or sales engineering, depending upon the capabilities and inclination of the individual.

Metallurgy

A student interested in a major in metallurgy will pursue studies leading to the degree Bachelor of Science in the College of Sciences and Humanities, see Sciences and Humanities, Curriculum. Students majoring in metallurgy will usually select the following basic courses: 203, 270, 270L, 301, 302, 301L. 302L, 360, 361, 400, 401, 402, 402L, and three additional credits in courses numbered 400 or above. As supporting work, undergraduate majors find the following courses desirable. Math 165, 169, 285, 296, plus one additional course in mathematics, statistics, or computer science. Phys 221, 222, Chem 167, 167L, E M 274, 324. These lists of courses are not regarded as fixed requirements or as complete outlines of work necessary for the major. Students will plan their complete programs with the help of their advisors.

Metallurgical Engineering

For the undergraduate curriculum in metallurgical engineering, see College of Engineering, Curriculum. The curriculum is based on a core of courses in chemistry, physics, mathematics, and metallurgical engineering principles. A wide choice of electives makes it possible for students, in consultation with their adviser, to develop a program that best fits their particular interests and aptitudes. Elective programs should complement the core curriculum, avoiding undue specialization or aimless diversification.

The department offers a cooperative education program, usually requiring five years, that
The department participates in the Energy Systems Engineering minor program and the interdisciplinary program of Technology and Social Change (See Index).

Open to graduate students for minor credit only. 301, 302, 301L, 302L, 321, 322, 337, 343, 344, 351, 352, 360, 361, 370L, 370L, 375, 401, 402, 402L, 410, 440, 441, 442, 445, 446.

301L. Metallurgy Laboratory. (0-6) Cr 2 F Prereq Credit classification in 301 Preparation and analysis of ferrous and non-ferrous metals. Quantitative optical microscopy, scanning electron microscopy, powder X-ray diffraction, hardness testing.

302L. Physical Metallurgy Laboratory. (0-6) Cr 2 S Prereq Credit or classification in 302 Experiments are carried out and analyzed which involve the following topics: Carburizing of steel, casting of bronze, brass and cast iron, Jominy end quench, induction hardening, X-ray and metallographic evaluation of retained austenite, age hardening of aluminum alloys, and welding of plain carbon and stainless steels.

302L. Physical Metallurgy Laboratory. (0-6) Cr 2 S Prereq Credit or classification in 302 Experiments are carried out and analyzed which involve the following topics: Carburizing of steel, casting of bronze, brass and cast iron, Jominy end quench, induction hardening, X-ray and metallographic evaluation of retained austenite, age hardening of aluminum alloys, and welding of plain carbon and stainless steels.

310L. Material Science Laboratory. (0-6) Cr 2 S Prereq Classification in 301 Preparation and analysis of ferrous and non-ferrous metals. Quantitative optical microscopy, scanning electron microscopy, powder X-ray diffraction, hardness testing.

312L. Material Science Laboratory. (0-6) Cr 2 S Prereq Classification in 302 Experiments are carried out and analyzed which involve the following topics: Carburizing of steel, casting of bronze, brass and cast iron, Jominy end quench, induction hardening, X-ray and metallographic evaluation of retained austenite, age hardening of aluminum alloys, and welding of plain carbon and stainless steels.


341. Application of Statistics to Materials. (0-3) Cr 1 S Prereq Stat 305 Application of statistical problems to problems concerning the materials used in ceramic and electronic devices.


345. High Temperature Processes (3-3) Cr 4 S Prereq 350 or Chem 321 Use of high-temperature treatments in the fabrication of ceramic products. Various techniques, including sintering and densification. Processes involving sintering and other techniques. Final test of lecture and laboratory involving the use of a ceramic test article.


357. Materials Science and Engineering (A E 357) (2-3) Cr 3 F Prereq Chem 167, EM 274 Introduction to atomic bonding, structure of crystals and polycrystalline aggregates, phase equilibria, strength and deformation of solids. Applications of thermomechanical processes to the selection of appropriate materials for use in the food industries.


360. Thermodynamics for Materials Science and Engineering (A E 360) (3-0) Cr 3 F Prereq Chem 167, EM 274 Introduction to atomic bonding, structure of crystals and polycrystalline aggregates, phase equilibria, strength and deformation of solids. Applications of thermomechanical processes to the selection of appropriate materials for use in the food industries.

361. Principles of Extractive Metallurgy (3-3) Cr 3 S Prereq 360 or Chem 321 Applications of chemical equilibrium, thermodynamics and reaction kinetics to the understanding of unit operations. Introduction to diffusion, heat transfer and fluid flow principles and the utilization in extractive metallurgy processes.

362. Principles of Nondestructive Testing (E M 362) (3-3) Cr 3 S Prereq Phys 112 or 222 Radiographic ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection and other less common techniques. Principles and applications of metallography to the selection of appropriate materials for use in the food industries.

363. Principles of Nondestructive Testing (E M 363) (3-3) Cr 3 S Prereq Phys 112 or 222 Radiographic ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection and other less common techniques. Principles and applications of metallography to the selection of appropriate materials for use in the food industries.

364. Principles of Nondestructive Testing (E M 364) (3-3) Cr 3 S Prereq Phys 112 or 222 Radiographic ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection and other less common techniques. Principles and applications of metallography to the selection of appropriate materials for use in the food industries.

365. Principles of Nondestructive Testing (E M 365) (3-3) Cr 3 S Prereq Phys 112 or 222 Radiographic ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection and other less common techniques. Principles and applications of metallography to the selection of appropriate materials for use in the food industries.
Courses for Graduate Students, major or minor, open to qualified undergraduates.


411. Refractories. 3 Cr. F, S. Prereq. 360, 302 or 345. Mineralogy, manufacture and service characteristics of fireclay, high alumina, silica, basalt, and carbon refractories in metallurgical and ceramic industries.

421. Metallurgical Engineering Design. 3 Cr. F, S. Prereq. 402. Application of physical, chemical and mechanical metallurgical principles to design of metal parts and processes.

501. Thermodynamics of Phase-change Processes in Solids. 3 Cr. F, S. Prereq. 301 or 345, 360, or Chem 321, Math 266. Review of basic principles, thermodynamic potentials, stability principles, effects of strain energy, solution thermodynamics, free-energy-composition diagrams, and thermodynamic driving force for phase transition and spinodal decomposition theory. Solidification


531. Advanced Extractive Metallurgy. 2 Cr. F, S. Prereq. 360 or Chem 321. Occurrence and production of metals, including the less common metals. Analysis of economic, stoichiometric, and thermodynamic principles in chemical metallurgy.

541. Applications of Metallurgical Thermodynamics. 3 Cr. F, S. Prereq. 501. Solubility of gases in metals, oxidation of metals and alloys, thermochromy of steels, atmosphere control with gas mixtures, special applications of Clausius-Clapeyron equation, use of Richardson-Keeler charts, thermodynamics of alloys.

510. Air Pollution Control. 3 Cr. F, S. Prereq. 360 or Chem 321. Occurrence and production of materials, including the less common metals. Analysis of economic, stoichiometric, and thermodynamic principles in chemical metallurgy.

542. Chemical and Physical Metallurgy of Ferrous and Non-ferrous Alloys. 3 Cr. F. Prereq. 360 or 345. Physical and mechanical properties of refractory hard magnetic substances including lattices, thin films, and fine particles. Major applications of ferromagnetic materials.


Mathematics

Wilfred E. Barnes, Head of Department

Professors: Abian, Allen, Althaya, Barnes, Carlson, Colwell, Comette, Dahya, Dickens, Fink, Hentzel, Homer, Issacson, Keller, Lambert, Levine, Luecke, Maple, Mathews, Miller, Peglar, Pigozzi, Sanderson, Seifter, A. K Steiner, E. F. Steiner, Tondra, Weiss, Wright

Emeritus Professors: Bottle, Hinchnen, Lindahl, Vinograde

Associate Professors: Cafen, Coronas, Gautes, Gregorac, Heckenbach, Hermes, Madych, Meany, Murdock, Rudolph, Smith, Sprague, Triggiani, Wilsson

Assistant Professors: Abatzoglou, Brandner, Davison, Epstein, Ho, Hogban, Johnston, Kegley, Kim, Lieberman, Madsud, Nelson, Peake, Peters, Robertson, Smiley, Walker, Wilson

Undergraduate Study

For the undergraduate curriculum in sciences and humanities, major in mathematics, leading to the degree Bachelor of Science, see Sciences and Humanities, Curriculum.

The program in mathematics offers training suitable for students planning to enter secondary school teaching, to work in mathematics and computation for industry or government, or to continue their studies in mathematics. The requirements for an undergraduate major in mathematics are designed so that the student may have opportunity for appropriate specialization to meet one or more of the foregoing objectives and, at the same time, obtain a thorough introduction to the mathematics underlying all of them.

The requirements for an undergraduate major include:

a) 175, 176, 270, 371, or 165, 166, 265, 266 or 267, 307.

b) 301, at least one of 302, 308, 471.

c) 414, 415, or 365, 465.

d) at least 9 additional credits chosen from 201 or any Math courses of 300 level or above.

e) a grade of C or better in all courses prerequisite to a required course.

The department strongly recommends that each student majoring in mathematics include in the program substantially supporting work beyond the minimum general education requirement of the college in one or more areas of application of mathematics, such as other mathematical sciences, engineering, natural science, or social science. In particular, it recommends that each student take Com S 111, 112, Phys 221, 222, and Stat 341, 342 (or Math 304). It also strongly recommends two years of French, German, or Russian for students contemplating graduate study in mathematics. Credits earned in 104, 105, 140, 141, 142, 151, 152L, 160, 195, 196 cannot be counted towards graduation by mathematics majors.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with majors in mathematics or applied mathematics, and minor work to students taking major work in other departments.

Students desiring to do graduate work with a major in this department should present at least 12 semester credits of work in mathematics beyond calculus. It is desirable that this include advanced calculus and abstract algebra.

The M.S. degree may be taken either with or without thesis. Candidates for the M.S. and Ph.D. degrees must pass a written examination covering basic graduate work. Ability to use foreign languages (nominally chosen from French, German, and Russian) as effective research tools in the student's area of specialization is required for the Ph.D.

Master of Science candidates must have one year and Doctor of Philosophy candidates must have two years of graduate teaching experience. These minimums are subject to increase in individual cases upon recommendation of the student's program of study committee and approval of the department head.

Open to graduate students for minor credit only:


Courses Primarily for Undergraduate Students

10. Introductory Algebra, (4-0) Cr. 3 SS only. For students who do not have adequate facility with topics from the first year of high school algebra. Properties of integers and rational numbers, linear equations, polynomials and factors, systems of linear equations in two unknowns, fractional expressions, radical expressions.

20. High School Geometry, (4-0) Cr. 0 SS only. For students graduating from high school. Topics from high school geometry: Elements of Euclidean geometry including congruence, parallel lines, circles, similar polygons, perimeters and areas, surface areas and volumes.

30. Intermediate High School Algebra, (4-0) Cr. 0 F SS. Prereq. 1 year of high school algebra. For students who do not have adequate facility with topics from the third semester of high school algebra. Systematic review of introductory algebra, linear equations and inequalities, systems of linear equations, fractional equations, radical equations, binalar expansion, exponents, logarithms, and graphs.

104. Introduction to Probability and Matrices, (3-0) Cr 3 F SS. Prereq. 1 year of high school algebra. Permutations, combinations, probability, binomial and multinomial theorems, matrices, Markov chains, expected value.

105. Introduction to Mathematical Ideas, (4-0) Cr 3 F SS. Prereq. 1 year of high school algebra. Topics selected from number theory, algebra, logic, and geometry with emphasis on their non-technical content.

125. Calculus Laboratory I, (0-0) Cr 1 F SS. Prereq. Classification in or credit for one semester of calculus. Problems arising from numerical, algorithmic approach to calculus solved by means of interactive computing.

126. Calculus Laboratory II, (0-0) Cr 1 F SS. Prereq. 125, classification in or credit for a second semester of calculus.

140A, 140B. Fundamentals of Algebra for Science and Higher Mathematics, (4-0), (3-0) Cr 3 F SS. Prereq. 1 year of high school algebra, 1 year of high school geometry. Coordinate geometry, complex numbers, quadratic and polynomial equations, functions, graphing, systems of equations, exponential and logarithmic functions, determinants. 140A is for students needing an extra contact hour to review prerequisite material. 140B is for students not needing such a review.

141. Trigonometry, (2-0) Cr. 2 F SS. SS. Prereq. 1 year of high school algebra, 1 year of high school geometry, or classification in or credit for one semester of trigonometric functions and their inverses, solving triangles, trigonometric equations, polar coordinates, graphing.

142. Trigonometry and Analytic Geometry, (3-0) Cr. 3 F SS. Prereq. 1 year of high school algebra, 1 year of high school geometry, or classification in. May be taken concurrently with 140 Trigonometric functions and their inverses, solving triangles, trigonometric equations, polar coordinates, standard equations of lines and conic sections, conics in polar form, graphing of rational functions, quadric surfaces.

150. Mathematics for Business and Social Sciences I, (3-0) Cr. 3 F SS. Prereq. 1 year of high school algebra. Linear equations and inequalities, linear programming, matrix algebra, discrete probability.

151. Mathematics for Business and Social Sciences II, (3-0) Cr. 3 F SS. Prereq. 104 or 150 Differential Calculus, integral calculus, introduction to max-min theory for functions of two variables. Will not serve as a prerequisite for 265 or 266 or 270.

152L. Computational Methods for Business and the Social Sciences, (0-0) SS. Prereq. 150 and credit or classification in 151. Numerical solution of problems studied in 150 and 151 through use of interactive computing.

160. Intuitive Calculus, (4-0) Cr. 4 SS. Prereq. 2 years of high school mathematics, 1 year of geometry. 1 semester of trigonometry or 141 or 142 Analytic Geometry, differentiation and integration of elementary functions. Will not serve as a prerequisite for 265 or 266 or 270.

165, 166. Calculus II, (4-0) Cr. 4 each F SS. Prereq. 1 year of high school algebra, 1 year of high school geometry, 1 semester of trigonometry or classification in 141 or 142. 166: 165 Functions, limits and continuity differentiation, integration, polar coordinates, vectors, etc.

185, 176. Calculus with Differential Equations I, II, (8-0) Cr. 5 each F SS. Prereq. 175. Same as for 165, 176. Functions, limits and continuity differentiation, integration, applications, polynomial coordinates, vectors, introduction to differential equations.

195. Mathematics for Elementary Education I, (4-0) Cr. 4 F SS. Prereq. 1 year of high school algebra, classification in elementary education or child development. Language of sets, systems of whole numbers, numeration and algorithms for whole numbers, topics from number theory, geometric concepts.

196. Mathematics for Elementary Education II, (2-0) Cr. 2 F SS. Prereq. 185 Topics in mathematics of current importance to prospective elementary teachers.
Emphasis on developing mathematical maturity
Primarily intended for mathematics majors

226. Differential Equations Laboratory. (3-0) Cr 1 F S
Prereq: Classification in 256 or 267. Analytical methods of solution of elementary differential equations supplemented by basic numerical methods for approximate solutions. Programming various algorithms for use on interactive computers Offered on satisfactory demand only

235. Elementary Multivariable Calculus, (4-0) Cr 4 F S S S. Prereq. 165. Series, functions of several variables, gradients, multiple integrals.


290. Special Problems. Cr 1 to 3 each time taken
H Honors

301, 302. Introduction to Abstract Algebra. (3-0) Cr each Yr. Prereq. 165, 166, 176, 302, 301 and one of 166, 176, 186. Introduction to the theory of groups and rings. 302 Theory of fields, abstract vector spaces, and linear algebra.


307. Theory of Matrices. (3-0) Cr 3 F S S S. Prereq. 1 semester of calculus. The algebra of matrices including vector spaces, simultaneous linear equations, determinants, quadratic forms, eigenvalues, and diagonalization for real and complex numbers.

308. Application of Linear Algebra to Discrete Optimization. (3-0) Cr 3 S Prereq. 270 or 302 or 307. Linear programming and topics chosen from game theory, voting methods, and assignment problems, discrete dynamic processes, and multiple objective linear programming.

311, 332. Topology. (3-0) Cr 3 each Yr Prereq. 165, 265, 270, 332, 331 Topological properties of metric spaces, compactness and connectedness, continuous functions, completeness, compactness, Abstract topological spaces and related properties, including compactifications, connectedness and fundamental groups.

365. Complex Variables with Applications. (3-0) Cr 3 F S Prereq. 265 or 371 Functions of a complex variable, including differentiation, integration and series expansions, residues, evaluation of integrals, conformal mappings.

385. Introduction to Partial Differential Equations. (3-0) Cr 3 F S S Prereq. 371, or 265 and one of 265, 267. Fourier series, separation of variables methods, Bessel functions, Legendre polynomials, introduction to Sturm-Liouville theory.

414, 415. Advanced Calculus. (3-0) Cr each Yr Prereq. 371, or 265 and 307. 414 A careful development of calculus of functions of a real variable, limits, continuity, differentiation, integration, series, 415 Calculus of functions from Rp to Rp linear and topological properties of Rp, limits, continuity, differentiation, implicit functions, multiple integrals, line and surface integrals of ordinary and vector fields.

421. Mathematical Logic. (3-0) Cr 3 Alt. S. offered 1982 Prereq. 201 or 301. Validity, consistency, provability, completeness, definability, and decision procedures for propositional calculus, predicate calculus, and first order number theory.


435, 436. Geometry. (3-0) Cr each Yr Prereq. 435. 270 or 307, 436. 435 Euclidean geometry through axioms Theophile Steiner (Euclid). 436 Non-Euclidean and projective geometry, curves and surfaces.


471. Computational Linear Algebra and Fixed Point Iteration. (Com S 471) (3-0) Cr 3 F S S S. Prereq. 270, or 265 and one of 266, 267, knowledge of FORTRAN. Computational error, solutions of linear systems, least square methods, similarity methods for eigenvalues, non-linear equations, fixed point iteration in one and several variables. Newton's method in several variables.

481. Numerical Solution of Ordinary Differential Equations and Interpolation. (Com S 481) (3-0) Cr 3 F S S S. Prereq. 265 or 266 and one of 266, 267, knowledge of FORTRAN. Orthogonal polynomials, least square and spline methods, finite differences, numerical integration, Euler, Taylor, Runge-Kutta, and predictor-correction methods for solution of systems of ordinary differential equations.

489. History of Mathematics. (3-0) Cr 3 S Prereq. 356 or 365. The development of mathematical ideas through the eighteenth century, with some emphasis on primary sources.

490. Independent Study Cr 1 to 3 each time taken
H Honors


*Either 104 or 150 may be counted toward graduation, but not both.

**Both of the sequences 165, 166, 265, 266 and 175, 176, 270, 371 will prepare a student for further study in 300-400 level mathematics courses. The main difference is that 266 covers an introduction to topology, whereas 176 covers the same material at a faster pace, introduces differential equations earlier, and places more emphasis on the use of linear algebra. Very little overlap exists between sequences. Both series contain a large amount of similar material, may not count toward graduation.

*No more than 3 credits of 141, 142 may count toward graduation.

**None of the 165-166, 175-176 sequences or 151 or 160 may count toward graduation.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

504, 505. Abstract Algebra. (3-0) Cr 3 each Yr. Prereq. 302. Algebraic systems and their morphisms, including groups, rings, and linear algebra.


509. Computationally Oriented Linear Algebra. (Com S 490) (3-0) Cr 3 F S S S. Prereq. 302 or 307, knowledge of FORTRAN. Numerical methods involved in the solution of linear systems, matrix inversion, eigenvalues and eigenvectors (non-orthogonal), polynomial interpolation, condition matrix, ill-conditioned matrices, linear inequalities. Examples using university computers.

510. Linear Algebra. (3-0) Cr 3 F Prereq. 302 or 307. Brief review of elementary linear algebra, followed by advanced topics, canonical forms, inner product spaces, bilinear forms, tensor products, and applications to other branches of mathematics.
Mechanical Engineering

Arthur E. Bergles, Chair of Department

Professors: Bahadur, Baumgarten, Bergles, Cook, Fellingar, Hall, Henkin, Junkhan, Kavanagh, Larson, Mische, Okishi, Peters, Pletcher, Serovy, Woods

Emeritus Professor: Black

Associate Professors: Bathe, Colver, Joensen, Myers, Wilson

Assistant Professors: Flugrad, Kuehn, Lee, Nelson, Shapiro, Van Meter

Undergraduate Study

For the undergraduate basic curriculum in mechanical engineering leading to the degree Bachelor of Science, see College of Engineering, Curricula.

Mechanical engineers are intimately involved with the processing, distribution, and use of energy, the processing of material, the control and automation of systems of production, the development of man-machine systems; and the development of vehicles of transport. About one-fourth of all engineers practicing today have been educated as mechanical engineers. Their activities include research, development, design, construction, testing, production, operation, sales, and technical management.

The undergraduate curriculum in mechanical engineering requires a broad foundation in mathematics and the fundamental sciences of physics and chemistry. This background is extended and organized for application in solid mechanics, fluid mechanics, thermodynamics, heat transfer, electrical phenomena, and materials. Additional courses in the design of experiments and engineering analysis provide the basis for real problem solutions in design courses.

Technical electives are provided to give the student the choice of additional broad or specialized extensions. Organized sequences of technical electives may be chosen from areas which represent the major teaching and research areas in the department. These optional areas of specialization are energy conversion and utilization, machines and systems, materials and manufacturing, thermal and environmental engineering, and vehicle propulsion.

A comprehensive sequence of electives in social and humanistic studies is a vital and integral part of the curriculum. The department collaborates in a program in the history of engineering. Students are encouraged to broaden their educational objectives by examining the offerings of all departments of the University and integrating additional studies into their educational plan.

The basic curriculum prepares students to enter established areas of mechanical engineering or to accept new challenges such as environmental protection, energy conservation, biomedical engineering, or similar inter-disciplinary endeavors. The elective opportunity provides for additional emphasis in terms of student's educational goals, whether they be immediate entry into industry or further study at the graduate level.

A five-year cooperative education program is available to students in the department.

The department cooperates with the Department of History in the offering of courses in the history of technology of interest to engineering students. See listings below under Courses in History of Technology.

Graduate Study

The department offers work for the degrees Master of Science, and Doctor of Philosophy with major in mechanical engineering, and minor work to students taking major work in other departments. Course offerings may be used in co-major or minor programs for students of other departments.

At the time of admission graduate students who have not completed an undergraduate program of study substantially equivalent to that required of undergraduate students in the department can expect that additional supporting course work, as determined by their program of study committee, will be required.

The graduate program emphasizes advanced study, including design and research, in such areas as fluid mechanics and turbomachinery, fluid power and controls, heat transfer, machines and systems, materials and manufacturing processes, and thermodynamics and energy utilization. Instrumentation and design of experiments are applied to all of these areas. Reliability, computational, dynamic, environmental, materials, and legal considerations in design are emphasized.

The department participates in the interdepartmental minor program of Energy Systems Engineering (See Index.)

The department encourages students to broaden their education by participating in minor programs in established departments, interdepartmental programs, or such other experiences as approved by their program of study committees.

The requirements for advanced degrees are established by the student's program of study committee. A foreign language requirement exists only for the degree Doctor of Philosophy when the student's program of study committee deems it appropriate to a specific program of study. It is possible to arrange a program of study for the Master of Science on a nonthesis basis.

Open to graduate students for minor credit only: 310, 311, 352, 321, 322, 331, 332, 335, 360, 411, 412, 414, 415, 436, 441, 442, 443, 444, 445, 446, 447, 448, 451, 460, 470, 475.

Courses Primarily for Undergraduate Students

100. Technical Lecture, (1-0) Cr R S Field of mechanical engineering, its opportunities and requirements

201. Industrial Inspection, Cr R S Prereq Sophomore mechanical engineering classification, Visitation of industries. Expenses required


298, 386, 488, Cooperative Education. Required of all cooperative students. Prereq Permission of department chairman 298. Work periods for students with sophomore standing in a regularly established program in terms of work periods for juniors 498. Work periods for seniors. Students must register for these courses prior to commencing each work period.

301 Mechanical Engineering Seminar, Cr R S Prereq Junior mechanical engineering classification.


311. Mechanical Systems, (3-2) Cr 3 F S Prereq Math 257, E E 441 Mechanical systems, their equations of motion and dynamic response, Fundamentals of industrial automatic control. Laboratory experiments and problems.

312 Design of Machine Elements, (3-0) Cr 3 F S Prereq Math 257. A philosophy of design failure models useful in fatigue and dynamic circumstances. Analysis selection and synthesis of machine elements

321 Behavior of Mechanical Materials, (MS 321) (2-2) Cr 3 F S Prereq Mech M E 270, E M 324. Application of the principles of structure of solids to the study and control of mechanical properties. Qualitative and quantitative relationships between microstructure and mechanical properties.

322 Manufacturing Processes, (2-2) Cr 3 F S Prereq Mech 321. The relationship between material properties, manufacturing processes, and product properties. The basic processes (casting, welding, forming, and machining) and the functional characteristics of equipment. Manufacturing considerations in design.


Mathematics/Mechanical Engineering


543. Energy Systems Engineering. (EE 543, Nuc EE 543) (2-0) Cr 3 F Prereq: One course in thermodynamics, EE 441, Econ 201 or 203 or E 304. Potential and limitations of energy sources. Energy conversion, utilization, and conservation in industrial, residential, and transportation systems. Energy-related economic and environmental, social, and political considerations.


546, 547. Computational Fluid Mechanics and Heat Transfer I, II. (Aer E 546, 547) (3-0) Cr 3 each. Yr. Prereq: 546. Credit or classification in 571 or Aer E 541, 547. Introduction to finite difference methods used in modern engineering. Solution of example problems in fluid mechanics and heat transfer. Application of computational methods to current problems in fluid mechanics and heat transfer.


561. Design of Engineering Experiments II. (3-0) Cr 3 Alt. S. offered 1982. Prereq: 360 or 560. Design of experiments to determine what data to take, how much data to take, and what precision and confidence limits on results. Selection of complete measurement systems to satisfy the response, sensitivity, resolution, isolation, and fiducial requirement by specifications of the experiment.

564. Fracture and Fatigue. (E M 564, M E S 564) (3-0) Cr 3 F Prereq: E M 324 and any one of E M 337, E Sc 352, M E 321, 270 or 271. Materials and mechanics approach to fatigue. Fatigue fracture mechanics, brittle and ductile fracture, fatigue and fatigue characteristics. Fracture and fatigue tests, thermal fracture, fracture mechanics and materials designed to avoid fracture and fatigue.


590. Special Topics. Cr 1 to 8. Investigation of problems of special interest to graduate students in mechanical engineering. Selection of a topic and problem must be approved in advance by G. through J. (Listing under 490).

Courses for Graduate Students, major or minor

600. Seminar. (1-0) Cr 1 F, R.

602. Advanced Machine Design. (3-0) Cr 3 Prereq At least two of 510, 514, 515, 516, 518, 5 E M 514, 517, 544. Concepts and procedures useful for synthesis decisions in advanced machine design including computational aids with an emphasis on high speed applications. Choice of work determined by interests of the class and instructor.


650. Fluid Mechanics Seminar. (Aer E 650, M E 650) (1-0) Cr 1 each time taken. F. Prereq. Permission of instructor. Special topics of current research interest to students and staff of department concerned.


650. Advanced Topics. Cr Var.

669. Research.

*Credit for both 530 and 630 may not be applied toward graduation.

Microbiology
(Bacteriology)
Paul A. Hartman, Chair of Department

Professors: Atherly, Durand, Hartman, Holt, Kraft, Lockhart, Pattee, Quinn, Walker, Williams

Associate Professors: Glatz, Loynachan

Undergraduate Study

For undergraduate curriculum in sciences and humanities, major in microbiology, leading to the degree Bachelor of Science, see Sciences and Humanities, Curriculum.

This department, principal emphasis is placed on understanding the interrelationships of microorganisms in nature, the application of microbiology in agriculture and industry, and the study of fundamental life processes exemplified by microorganisms. Varied careers are open to qualified graduates in hospital and clinical laboratories, in federal, state, or local government organizations, and in research and development and quality-control laboratories maintained by the dairy and food processing, pharmaceutical, and fermentation industries, among others. Some fields of microbiology, especially advanced research, may require further training. Undergraduate work in the department is designed to provide sound preparation for graduate study.

Undergraduate programs usually include the following basic courses. 300, 310, 320, 400, 450, 490 and 575. Courses in the following areas are required as supporting work: biology, botany, biochemistry, cell biology, genetics, mathematics, and philosophy. Graduates in microbiology are placed in the departments of Veterinary Microbiology, Allied Health, and Food Technology, respectively.

Specific prerequisite to major work in microbiology is the completion of thorough course work in general microbiology, biology, organic chemistry, biochemistry, mathematics, and physics. Minor study usually is selected from chemistry, biochemistry and biophysics, botany, zoology, genetics, and the physical sciences.

The department also participates in the interdepartmental programs in Immunobiology, Molecular, Cellular and Developmental Biology, and Water Resources (see Index).

Each graduate student must have received a grade of B or better in English composition or pass the Graduate English Examination within the second semester in residence.

Candidates for the Ph.D. degree must demonstrate their ability to translate scientific articles from one modern foreign language into English. All language examinations are administered by the department. Graduate students are encouraged to take at least one laboratory section each year in residence.
Courses Primarily for Undergraduate Students

300 Introductory Microbiology (2-6) Cr. 4 F SSS
Prereq: Bot 110; 1 semester of chemistry. The characteristics of microorganisms and their roles in disease, in the environment, and in industry

310 Pathogenic Microbiology (3-4) Cr. 4 F SSS
Prereq: a course in organic chemistry. Study of pathogenic bacteria and other microorganisms. Clinical laboratory techniques for the identification and characterization of pathogens

311 Introduction to Parasitology (Zool 311) See Zoology

320 Advanced General Bacteriology (3-6) Cr. 5 S
Prereq: 300, a course in organic chemistry. A survey of the prokaryotes with emphasis on bacterial physiology, ecology, and disease. The isolation, cultivation, and study of bacteria

400 Molecular Biology of Bacteria and Viruses, (3-0 or 3-4) Cr 3 or 4 F Prereq: 300, Gen 330 Survey of bacterial, plant and animal virology. Emphasis on bacterial genetics and virus-host cell interactions. Laboratory emphasizes mutagenesis and genetic characterization of bacteria and viruses

421 Food Microbiology Laboratory (F Tch 421) See Food Technology

425 Food and Water Sanitation (F Tch 425) See Food Technology

450 Undergraduate Seminar, Cr 1 each time taken F S Prereq: Sp 212. Required of all undergraduate majors in microbiology. Offered on a satisfactory/fail basis only

485 Soil Biology (Agron 485) See Agronomy

490 Independent Study Cr 1 to 5 F S SS Prereq

Military Science

Norman L. Rue, Head of Department
Professor: Rue
Associate Professor: Devens
Assistant Professor: Campbell
Instructor: Brewer, Hildebrand

Iowa State University graduates who successfully complete the military science program receive a double diploma: an academic degree and a commission as a Second Lieutenant in the United States Army. A commission as an Army officer affords the opportunity to pursue a profession in one or several of the 388 different jobs held by Army officers. Students who complete the military science program and do not desire to serve on active duty may request to serve as an officer in an Army Reserve or National Guard unit. This is an outstanding and well-paying part-time job. Regardless of the method of service, officers in the Army can be proud to know that they are doing their share in the defense of the United States of America.

The ISU military science program is divided into two segments: the basic course and the advanced course. The basic course (courses numbered 101-210) is designed primarily for freshmen and sophomores. No military obligation is incurred by a person participating in the basic course. The basic course is designed to be informative and to acquaint students with the military as a profession. It formulates a basis of information upon which students decide if they wish to enter the advanced course, and it provides the military science cadre an opportunity to evaluate persons to determine if they have the leadership and managerial potential to become Army officers. The advanced course is structured to provide the necessary preparation to qualify as a basic commissioned officer. Further schooling of about 3 months qualifies the officer in a particular military skill and branch of the Army. Students may enter the advanced course several ways. (1) They may elect to progress from the basic to the advanced course. (2) They may apply for and complete a 6-week basic camp at Fort Knox, Kentucky. Students attend this camp without obligation and receive pay for their participation. Attendance at the camp is accepted in lieu of the basic course. (3) Veterans may elect to use their active duty as a substitute for the basic course. (4) Junior ROTC graduates who have successfully completed JROTC in high school may elect to enter MS III. (5) Selected college students may enroll in a special 90-hour contact program that will provide entrance into the Advanced Program. (6) College students that are members of the National Guard or Army Reserve may join the Simultaneous Membership Program (SMP) and enter MS III.

Persons entering the advanced course must execute a contract with the Army. Obligations under the terms of the contract will vary: (1) persons who become part-time officers in the U.S. Army Reserve or the National Guard have a 90-120 day active duty obligation for further training as an officer, which is followed by part-time service ranging from 4 to 8 years. (2) Non-scholarship students assigned to active duty must have a 3-year obligation. (3) Scholarship students have a 4-year active duty obligation. Officers serving on active duty may complete their total military commitment of 6 years through part-time service with the U.S. Army Reserve, National Guard or on the part-time stand-by service. A student who willfully fails to observe the contract terms may be called to active duty in an enlisted grade. Other students may enroll in a particular course, subject to the approval of the Professor of Military Science.

Financial assistance is available to military science students as follows:

1. All military science texts, laboratory materials, and uniforms are provided at no expense to the student. A small deposit is required for the issue of the uniform. This deposit is returned upon satisfactory turn-in of the uniform.

2. High school seniors may compete for 4-year Army ROTC scholarships, which pay for tuition, books, laboratory fees, supplies, and provide an allowance of $100 per month during the normal school year.

3. Military Science I students are eligible to compete for 3-year Army ROTC scholarships.
Molecular, Cellular, and Developmental Biology
(Interdepartmental Major)

S Bishop, Chair, Supervisory Committee

Supervisory Committee: G C Brown, J Horwitz, M H Strother

Undergraduate Study
A special program in molecular, cellular, and developmental biology is not offered for the baccalaureate. Undergraduates wishing to prepare for graduate study in molecular, cellular, and developmental biology should elect courses in botany, genetics, microbiology, and zoology. Mathematics through calculus, chemistry through organic, and one year of physics. Zool 325 or Bot 444 are recommended to qualified undergraduates desiring an introduction to this area.

Graduate Study
Work is offered for the degrees Master of Science and Doctor of Philosophy with major in molecular, cellular, and developmental biology in several cooperating departments. Animal Science, Biochemistry and Biophysics, Botany, Food Technology, Genetics, Microbiology, and Zoology.

Facilities and qualified faculty are available in these departments for conducting fundamental research in the three focal areas of the program structure and function of muscle, mechanisms of information storage and transfer, cell interactions and membranes. Ongoing research involves studies with viral, prokaryotic, and eukaryotic systems.

Students majoring in molecular, cellular, and developmental biology will become affiliated with a department and choose a major professor from the participating faculty in that department. All PhD students are required to take a core curriculum consisting of the following courses: one year of biochemistry (B B 404, 405 or B B 501, 502), molecular genetics (Gen 620 or Micro 610), cell biology (B B 526 or Zool 526), developmental biology (B B 675, Gen 619, Zool 534 or Zool 631) and senior MCB (MCD 698). M S students take the above core but may delete either the molecular genetics, cell biology, or developmental biology complement. Additional course work is selected to meet departmental requirements and to satisfy individual student research interests. Courses may be chosen from those listed below. The foreign language requirement is determined by the student's major department.

All graduate students are required to teach as part of their training for an advanced degree.

Courses for Graduate Students, major or minor

508. Vertebrate Virology. (Micro 508) See Microbiology

509. Plant Virology. (PP SW 509) See Plant Pathology and Weed Sciences

512. Plant Growth Regulation. (Bot 512) See Botany

526. Cell Biology of Selected Eukaryotic Cell Systems (B B 526) See Biochemistry and Biophysics

528. Cellular Growth and Regulation. (Zool 528) See Zoology

529. Fine Structure of Plant Cells. (Bot 529) See Botany

534. Molecular Development and Differentiation. (Zool 534) See Zoology

535. Laboratory in Cytogenetics. (Gen 535) See Genetics

547. Biological Applications of Microscopy (F-Tech 547) See Food Technology

560. Evolutionary Genetics. (Gen 560) See Genetics

574. Microscopy. (B B 574) See Biochemistry and Biophysics

575. Laboratory in Microscopy. (B B 575) See Biochemistry and Biophysics

590. Special Topics. Cr Arr

599. Comparative Anatomy and Physiology of Bacteria (Micro 600) See Microbiology

Military Science and Music

Military Science

Military reviews and ceremonies, close order drill, leadership reaction, rappelling, land navigation, patrolling, cross country skiing, first aid, and participation in Army Physical Fitness Test. Locations to include Camp Dodge, Holston State Forest, Pammel Woods (ISU Campus), and the ISU Armory.

201. American Military History. (2-0) Cr 2 F The development of American military institutions, policies, experiences, and traditions in peace and war from colonial times. Emphasis on the role of the Army and the application of the principles of war.


210. Principles in Basic Military Skills. Cr 6 SS Prereq Permission of department head. Basic military skills for students with no prior military or ROTC training. Involves attendance at the six-week Army ROTC Basic Camp. Fort Knox, Kentucky. Completion enables students to enroll in the Advanced Course and is taken in lieu of 101, 102, 201 and 202. Offered on a satisfactory-fail basis only.

Advanced Course

301 Small Unit Tactics. (3-0) Cr 3 F Prereq Completion of the basic course Organization, composition, and missions of operational elements. Principles of joint combined operations with emphasis on the attack, withdrawal, retrograde, delay, patrolling, combat intelligence, tactical communications, and the troop leading procedure.

302. Methods of Instruction Military Skills. (3-0) Cr 3 S Prereq Completion of the basic course. Development of effective military writing techniques, basic educational psychology, oral presentation techniques, use of training aids, and lesson planning. Students prepare presentations incorporating all phases of effective instruction on fundamental individual combat, survival, navigational and conditioning skills to prepare them for advance camp and duties as junior officers.

301A, 302A, 401A, 402A. Advanced Leadership Laboratory. (0-2) Cr 1 Prereq Completion of basic course. On-the-job training and evaluation provided by the ROTC cadre. Students planning various events, and accepting responsibility for the leadership labs. The Swim test, Army Physical Fitness Test and the diagnostic map test required of candidates for a commission.

310, 410. Field Training Exercise (FTE). (2-0) Cr 1 Prereq Completion of basic course. An annual military exercise that requires approximately 50 hours of planning, planning, plus ROTC cadre evaluation. Designed primarily for the advanced ROTC cadets in preparation for being commissioned as officers in the U.S. Army. Actual military conditions are simulated, detailed instruction in both weapons training and execution of a simulated Operation Order in accomplishing a specific military mission. Conducted as a weekend problem at Camp Dodge.

401. The Military Team. (3-0) Cr 3 F Prereq Completion of the basic course. Organization and operational concepts of the military staff, military units, and organizational structures within the Army division. Combat operations and their various elements, with emphasis on planning and coordination.

402. Seminar: The Professional Officer. (3-0) Cr 3 S Prereq Completion of the basic course. Management, leadership, and management skills in preparation, practices, theories, and principles; leadership principles, traits, and application, and introduction to military justice, administration and logistics.

Military Science and Music
Music

Arthur G. Swift, Head of Department

Professors: Bleyle, Burkhalter, Swift, von Grabow, White
Emeritus Professor: Niemack
Associate Professors: Barnum, Bjurstrom, David, Koupal, Messenger, Molin, Reynolds, Woods
Assistant Professors: Chanstensen, Darlington, Dickson, Haug, McKinney, Ransom, Saral, Schlicting, Snyder, Tabbat
Instructors: Prater, Simonson, Stuart

Undergraduate Study

The Department of Music maintains a philosophy of education that draws its goals from the larger purposes of liberal arts education as defined in the statement of mission of the College of Sciences and Humanities. The department seeks to make music an integral part of all students’ lives, so that they may find their places within the continually evolving musical tradition.

To this end the department provides a comprehensive education through music including:

1. The development of aesthetic sensitivity and the broadening of the aesthetic environment.
2. The development of intellectual understanding in music.
3. The development of skills: performance, visual and aural analysis, teaching and composition.
4. The development of environments which stimulate and encourage creativity.
5. The development of verbal and nonverbal communicative abilities.

This comprehensive education in music prepares the student for life-long growth in the musical arts and includes activities reflecting the general university commitments to teaching, creative and scholarly activities, and service.

The program of the music department is twofold:

1. To provide opportunities for any student to develop an understanding and appreciation of music as part of a liberal education. Courses in music literature, theory, and areas of performance are available to the general student.
2. To provide a four-year course of professional studies to students who wish to prepare for careers in teaching, performance, composition, and graduate studies in music or related areas.

The Department of Music is a full member of the National Association of Schools of Music.

Bachelor of Arts — Music Major

For the undergraduate curriculum in sciences and humanities, major in music, leading to the degree Bachelor of Arts, see Sciences and Humanities, Curriculum.

Bachelor of Music

For the undergraduate curriculum in music, leading to the degree Bachelor of Music, see Sciences and Humanities, Curriculum.

Candidates for the Bachelor of Music will complete the following requirements:

- General education
  - 0.5 Library
  - 46 Music core

Music major (Students must select one of the following areas of concentration: history and literature, music education, organ, piano, string instruments, theory-composition, voice, and wind or percussion instrument)

General Requirements

Audition and Placement Requirements. To be accepted as a music major, the student must demonstrate an appropriate level of performance as well as potential in at least one performing medium. In addition, a student must satisfy the complete placement examination in music theory and keyboard skills, which will be administered to all applicants. The placement examinations will be given by members of the department faculty during summer orientation. The week preceding the opening of classes for fall semester, or by appointment. Students should request these examinations in the Department of Music office before deciding on a major in music.

Seminars and Recitals. All music majors enrolled for applied music courses will attend a weekly 1-hour seminar in their areas and departmental recitals each semester.

Continuation Examination. To be approved for continuation as a music major on the junior level, a student must pass a continuation examination taken normally at the end of the fourth semester. Before taking this examination, the student must have passed the departmental piano and ear-training proficiency examinations. To pass the continuation examination the student must display acceptable solo ability and performance techniques in at least one of the applied areas. The examination also includes a review of academic standing and discussion, with the student, of the implications.

Graduation Proficiency. To be recommended for graduation, a music student must demonstrate to the music faculty mature acquaintance with performance styles, technique, and repertoire. All music majors will participate in departmental recitals to the satisfaction of the department. Candidates for the Bachelor of Music degree will present a graduation recital.

Graduate Study

Courses open for graduate minor credit are.
430, 440, 471, 472, 473, 474, 475

Courses Primarily for Undergraduate Students

19. Applied Music: Preparatory, (4-0) Cr. 0 F SS Prereq: Audition, permission of instructor and department head. Applied music for nonuniversity students emphasizing musical education in elementary and secondary schools. One time taken per student.

100 Fundamentals of Music, (1-2) Cr. 2 F SS Prereq Ability to read elementary musical notation. Notation, recognition, execution and analysis of scales, intervals, triads, and rhythm, key signatures, time signatures, transposition.

102 Introduction to Music Literature I, (3-0) Cr. 3 S SS Prereq Music Fundamentals of Music. Expansion of the music listening experiences of the general student through greater awareness of differences in techniques of listening, performance styles, and materials of the art. Introduction to the components of music: form, and historical chronology via listening. Student need not be able to perform or read music. Open to non-majors only.

103 Introduction to Music Literature II, (3-0) Cr. 3 S SS Prereq Music 102. Continuation of music listening experiences of the general student through directed listening and discussion-analysis. Study of instrumental and vocal compositions for solo, chamber, and large ensemble media. Emphasis on stylistic differences among composers and musical periods. Open to non-majors only.

111 Wind Ensemble I, (3-0) Cr. 1 each time taken F SS Prereq Open to all students who qualify by audition. Emphasis on significant extended compositions for wind and percussion instruments. Open to non-majors only.

112 Concert Band I, (0-5) Cr. 1 each time taken F SS Prereq Open to all students who qualify by audition. Emphasis on significant extended compositions for wind and percussion instruments. Open to non-majors only.

113 Jazz Ensemble, (0-1) Cr. 1 each time taken F SS Prereq Audition, permission of instructor. Designed to explore various styles and trends in contemporary jazz.

114 Marching Band, (0-1) Cr. 1 each time taken F SS Prereq Audition, permission of instructor. Open to instrumentalists who have performed on a wind or percussion instrument in high school band or orchestra. Performance of pregame and halftime shows at each home and one away football game. Previous marching band experience not required.

118 Applied Music: Nonmajors, (4-0 to 1-0) Cr. 1 or 2 each time taken F SS Prereq Audition, permission of instructor. Applied music for the general student. Will not satisfy applied music requirements for music majors. See 119 for letter designation for various instruments.
119, 219, 319, 419. Applied Music: Majors. (Yr 2 or 2-1) Cr 1-3 each time taken SS. Prereq: Audition, permission of instructor; restricted to music majors. Minimum weekly credit of 3 hours per credit is expected. Weekly seminar required. Fee A: Voice B: Piano C: Organ D: Strings E: Carillon F: Woodwinds G: Brass I: Percussion K: Harp

120. Introduction to Music Listening. (3-0) Cr 3 F Prereq: Music major classification. Directed studies via aural analysis for music majors with emphasis on the materials of music, form, and aesthetic issues. Introduction to the structure and analysis of the major performance media in context of historical chronology. Fundamentals of score reading and performance terminology.

127. 128. Class Study in Piano I (3-0) Cr 1 each F S Prereq: 127 Audition, permission of instructor, 128. 127. Major scales, beginning harmonization and transposition, sightreading, repertoire. 128. Harmonic minor scales, harmonic analysis, transposition, sightreading, repertoire.

130. Introduction to Music Theory. (0-2) Cr 1 F Prereq: Music placement examination. Designed for students who were enrolled in Music 226 or who have a need for basic aural-perceptual skills as demonstrated by performance on a placement test. Intensive training in sight-singing, ear-training, and related aural skills.

131. Cardinal Keynote Singers. (0-2) Cr 1 each time taken. F S Prereq: Two semesters experience in one of the following 141, 151, 161, 171 Small mixed choruses featuring various forms of popular music. Performances on and off campus.


141. University Chorus. (0-3) Cr 1 each time taken F S Prereq: Open to all students who have performed on a wind or percussion instrument in band or orchestra. One concert presented in SS.

151. Octoro Chorus. (0-4) Cr 1 each time taken F S Prereq: Open to all students by audition. Concerts with ISU Symphony performances in conjunction with International Orchestra Festival. Rehearsals three times weekly.

156. Summer Chorus. (0-2) Cr 5 each time taken SS. Open to students, staff, and community.

161. Iowa State Singers. (0-5) Cr 1 each time taken F S Prereq: Present Examination of common campus, annual spring tour, and performances in conjunction with International Orchestra Festival. Rehearsals five times weekly.

171. Chamber Singers. (0-2) Cr 1 each time taken F S Prereq: Open to all students by audition. Several appearances annually by a select group capable of advanced study, performing music suitable to small ensemble, materials through modern.

181. Symphony Orchestra. (0-2) Cr 1 each time taken F S Prereq: Open to all students by audition. Reading, preparation, and performance of standard repertoire Three concerts annually plus occasional off-campus appearances.

186. Summer Orchestra. (0-2) Cr 5 each time taken SS. Open to students, staff, and community.


200. Special Problems. Cr 3-0 F S Prereq: Permission of instructor, A through F. 12 credits in music, approval of department head, H approval of department head.


206. Conducting II. (1-2) Cr 2 S Prereq: Section A: Choral techniques Style and interpretation of choral repertoire Section B: Instrumental techniques Advanced baton technique Score preparation Specific problems of large instrumental ensembles.

201. Opera Studio. (1-3) Cr 1 each time taken F S Prereq: Permission of instructor. Interpretation and coaching of selected opera scenes and opera performances, including informal and public presentations.

248. English and Italian Diction for Singing. (0-2) Cr 2 F S Prereq: Credit or classification in 114A or 115A. Phonetic alphabet and its application to correct pronunciation of English and Italian in singing.

249. French and German Diction for Singing. (0-2) Cr 2 F S Prereq: Classification in 114A or 115A. Phonetic alphabet and its application to correct pronunciation of French and German in singing.

330. Advanced Materials of Music. (3-2) Cr 4 each time taken F S Prereq: Examination of materials for school use. For the instrumental music specialist.

351. Instrumental Techniques: Clarinet, Flute, Saxophone. (1-2) Cr 2 S Prereq: Techniques and skills required for teaching of instruments. Examination of materials for school use. For the instrumental music specialist.

352. Instrumental Techniques: Oboe, Bassoon. (0-2) Cr 1 F Prereq: Techniques and skills required for teaching of instruments. Examination of materials for school use. For the instrumental music specialist.

353. Instrumental Techniques: Trumpet, French Horn. (0-2) Cr 1 S Prereq: Techniques and skills required for teaching of instruments. Examination of materials for school use. For the instrumental music specialist.

354. Instrumental Techniques: Trombone, Baritone, Tuba. (0-2) Cr 1 F Prereq: Techniques and skills required for teaching of instruments. Examination of materials for school use. For the instrumental music specialist.

355. Instrumental Techniques: Percussion. (0-2) Cr 1 F Prereq: Techniques and skills required for teaching of instruments. Examination of materials for school use. For the instrumental music specialist.

356. Instrument Maintenance and Repair. (0-2) Cr 1 F Prereq: Techniques and skills required for basic maintenance and repair of instruments. Examination of materials for school use. For the instrumental music specialist.

360. Vocal Pedagogy. (0-2) Cr 2 S Prereq: 319A or vocal proficiency examination. Physical, acoustical, and musical properties of the vocal instrument, including a survey of important texts and articles on singing and voice production.


Naval Science

Head of Department

Professor: Shewchuk

Instructors: Bailey, Black, Chambers, Huber, Rau

The function of the Navy and Marine Corps officer education programs is to provide, by a permanent system of education in essential naval science and other academic subjects at civil education institutions, a source from which qualified officers may be available for the Navy and the Marine Corps and their reserve components.

Students who enter the Navy and Marine Corps officer education programs may apply for either of two programs, the NROTC scholarship program (full scholarship, which includes books, tuition, laboratory fees, uniform, and $100 per month), or the college program (nonscholarship, limited financial assistance). Applicants for the scholarship program are selected through comprehensive nationwide competitive procedures. Applicants for the college program are selected by the Professor of Naval Science from among students already in attendance at or selected for admission by the University. This program only involves financial assistance of $1,000 for each of the last two academic years. NROTC students pursue their studies like other students except that they meet certain requirements that will prepare them to serve as officers after graduation. A scholarship program student incurs a 4-year military obligation as a commissioned officer after graduation, a college program student incurs a 3-year obligation. If a scholarship student fails to earn a degree, if a commission is not tendered (for other than physical reasons), the student then incurs a 2-year obligation in an enlisted grade. This obligation is not incurred until the junior year has commenced. Information is available from the Professor of Naval Science, Iowa State University, concerning application, financial assistance, career opportunities, and active duty obligation. Also see Officer Education Programs.

While in the program, students will participate in summer at-sea training cruises with pay, and will be expected to take part in extracurricular activities that will help them decide which field of the Navy or Marine Corps they wish to enter. These activities include three cruises for scholarship students, several student societies, and indoctrination trips to a naval air station, a submarine base, and a Marine Corps base.

Undergraduate Study

Naval science courses are primarily for those students in the NROTC program. However, other university students may also enroll in naval science courses. All students enrolled in the NROTC program must fulfill the following requirements:

1. N.S. 111, 112, 211, 212, 311, 312, 411, 412

Marine option students will substitute N.S. 311M, 312M, 411M, and 412M for the 300 and 400 series listed above.

2. All NROTC students must complete one semester of a major Indo-European or Asian language prior to graduation. All NROTC students not enrolled in engineering or approved science majors are required to take a course in American military affairs and national security policy. Engineering and approved science majors are encouraged to undertake these courses to fulfill electives within the major.

3. All Navy option scholarship students must complete Math 165, 166, or 175, 176 by the end of the sophomore year. Phys 221, 222, by the end of the junior year. Additionally, those majoring in liberal arts or other non-technical curricula will include at least two science/engineering courses as electives.

4. In addition to the normal naval science courses, all NROTC students are required to participate in laboratory periods that supplement the various academic courses, emphasize human relations principles, teach basic military formations, movements, commands, courtesies, and honors, and provide practice in unit leadership.

5. NROTC students are not required to major in naval science. Navy option scholarship students are expected to major in engineering or approved sciences. Other degree programs may be pursued if complementary to the naval profession and approved by the head of the department. Nonscholarship Navy option students and Marine Corps option students may pursue any major leading to a bachelor’s degree.

In addition to completing all naval science courses, students majoring in naval science must take the following courses: Chem 163L, 164L, Com S 111, 112, geography, 3 credits; Hist 390, Math 165, 166 (175, 176), Phys 221, 222, Pol S 251, 258, Psych 101, Stat 101. Marine Corps option students majoring in naval science will take the 300M- or 400M-series courses in lieu of the 300 and 400 series naval science courses.

For basic undergraduate curriculum requirements, see Sciences and Humanities, Curriculum, or Engineering, Curriculum.

Nuclear Engineering

George Burnet, Chair of Department

Professors: Burnet, Danosky, Roberts, Rohach, Wechsler

Associate Professors: Barcus, Hendrickson, Ma, Sebit, Valent

Undergraduate Study

For the undergraduate curriculum in nuclear engineering leading to the degree Bachelor of Science, see College of Engineering, Curricula.
Nuclear engineering is that branch of engineering associated with the release, control, and utilization of all types of energy from nuclear sources. Nuclear engineers are responsible for research, development, design, construction, operation, and management of systems for the controlled release of nuclear energy and the applications of radiation for medical, agricultural, and industrial use.

Industry, government, and universities employ nuclear engineers in areas such as reactor analysis, radioscopes applications, computer applications, energy transfer, radiation protection, safety analysis, materials selection, and instrumentation and control. Work may involve economics, legal processes, regulation and inspection, construction, manufacturing and sales, and management.

Nuclear engineering requires a broad foundation in mathematics and the physical sciences, and draws upon many other technical disciplines. The curriculum includes courses in mathematics, physics, chemistry, electrical theory, solid and fluid mechanics, heat transfer, thermodynamics, radiation safety, nuclear reactor theory, and nuclear fuels and wastes, as well as technical and sociocultural electives. In the senior year, the design provides the student with experience in application of the knowledge gained in the technical courses. Computers are used extensively in design and problem solving. Oral and written communications skills are emphasized.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Cr. R S Orientation in the field of nuclear engineering.

211. Fundamentals of Nuclear Engineering. (2-3) Cr. 3 F S Prereq: Credit or classification in Phys 221, Core S 172 Fusion, fission, and isotopic energy sources Reactor theory and comparison of fission and fusion. Mass balance and energy balances. Formulation of problems in nuclear engineering and analysis of experimental data. Radiation measurement and control. Practical experience in research.


296, 398, 498. Cooperative Education. Required of all cooperative students. Prereq: Permission of department head or in the case of students with sophomore standing in a regularly established program. 398 Work periods for juniors. 498 Work periods for seniors. Students must register for these courses prior to work period.

301. Nuclear Power: Technical Concerns and Social Issues (Soc 301) (2-0) Cr. 2 F The relationship between nuclear energy and society is examined from both a technical and a sociocultural viewpoint, including political and social costs of energy policies and weapons proliferation.


331L. Laboratory in Reactor Analysis. (0-2) Cr. 1 F Prereq Classification in 331 Laboratory. Laboratory work to accompany 331L. 331S. required of undergraduate nuclear engineering students.


411. Radiation Protection and Dosimetry. (2-0) Cr. 3 S Prereq 291 Reactivity and nuclear reactors. Basic concepts and states of radiation protection.


461. Nuclear Systems Laboratory. (0-0) Cr. 1 F S Prereq 381. Credit or classification in M E 436. Laboratory study of basic processes involved in nuclear reactor systems. Performance and operation of system components. Non-destructive examination.

471. Fusion Reactors. (3-0) Cr. 3 S Prereq 331. The technological requirements of magnetic confinement. Plasma fusion and design. Magnetic and laser fusion systems. Fusion-fusion hybrids. Safety aspects.


483. Nuclear Radiation Engineering. (3-0) Cr. 3 S Prereq 291. Nuclear engineering applications other than those oriented towards large scale power production. Isotopic power sources. Radiation gauging. Biomedical, agricultural, and chemical industry uses of radiation. Radiation detection and activation analysis.


491, 492, Seminar. (1-0) Cr. R F Prereq: Senior classification.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

521. Nuclear Physics for Engineers. (3-0) Cr. 3 F Prereq 291. Radiation production by nuclear reactions. Nuclear properties. Energy transfer, radiation, and utilization of all types of energy from nuclear sources. Nuclear engineering is that branch of engineering associated with the release, control, and utilization of all types of energy from nuclear sources. Nuclear engineers are responsible for research, development, design, construction, operation, and management of systems for the controlled release of nuclear energy and the applications of radiation for medical, agricultural, and industrial use.

Industry, government, and universities employ nuclear engineers in areas such as reactor analysis, radioscopes applications, computer applications, energy transfer, radiation protection, safety analysis, materials selection, and instrumentation and control. Work may involve economics, legal processes, regulation and inspection, construction, manufacturing and sales, and management.

Nuclear engineering requires a broad foundation in mathematics and the physical sciences, and draws upon many other technical disciplines. The curriculum includes courses in mathematics, physics, chemistry, electrical theory, solid and fluid mechanics, heat transfer, thermodynamics, radiation safety, nuclear reactor theory, and nuclear fuels and wastes, as well as technical and sociocultural electives. In the senior year, the design provides the student with experience in application of the knowledge gained in the technical courses. Computers are used extensively in design and problem solving. Oral and written communications skills are emphasized.

Graduate Study

The department offers work for the degrees Master of Science, Master of Engineering, and Doctor of Philosophy with a major in nuclear engineering. Minor work in nuclear engineering is offered to students taking major work in other departments.

Students may prepare for graduate work in nuclear engineering by pursuing undergraduate programs in the physical sciences. It is recommended that students contemplating graduate studies in nuclear engineering include courses in modern physics, heat transfer, thermodynamics, chemistry, and mathematics (beyond differential equations) as part of their undergraduate preparation.

Admission to the EAC/ABET-accredited Master of Engineering program is restricted to those students having a bachelor's degree from an EAC/ABET-accredited engineering curriculum or the equivalent.

For the degree Doctor of Philosophy, a foreign language may be required by the student's program of study committee.

Because materials are an important aspect of nuclear engineering, there is an interdisciplinary arrangement with the Department of Materials Science and Engineering. Nuclear engineering students interested in materials aspects of nuclear energy technology are encouraged to consider graduate study in the materials science and engineering departments.

The department also participates in the interdepartmental minor programs of Energy Systems Engineering, Water Resources, and Technology and Social Change. (See Index.)

Open to graduate students for minor credit only 331, 361, 401, 411, 441, 444, 451, 471, 481, 482, 484.
582. Nuclear Reactor Engineering Systems. (3-0) Cr. 3

585. Nuclear Power Plant System Design. (1-4) Cr. 3, S.
Pre Req: Credit or classification in 532, 582. Overall design of nuclear power plants. A group project with individual components or system design and integration into the total project. Component and material selection. Control, shielding, siting, licensing, engineering safeguards, and economic considerations.

590. Special Topics. Cr. var. Topics of special interest in nuclear engineering.

Courses for Graduate Students, major or minor


661 Advanced Nuclear Engineering Laboratory. (2-3) Cr. 3 S. Pre Req: Credit or classification in 532, 582. Performance evaluation of nuclear systems using standard and experimental measurement methods.


690. Special Topics. Cr. var

695 Advanced Seminar. (1-0) Cr. R F S. Presentations and discussions of advances and problems in contemporary nuclear engineering.

Research.

Financial assistance grants are made to all students enrolled in advanced ROTC programs, and are described under Financial Aids. Scholarships are also available for all services as outlined in the section on Financial Aids. ROTC is recognized as a subject matter area of specialization. The following categories of credit allocation are recognized.

I. A student can major in Navy ROTC in the College of Sciences and Humanities, applying 24 credits toward the major.

II. In colleges where minors are part of the curriculum, 15 credits of advanced ROTC may be applied toward the minor. Nine credits of basic ROTC may be applied toward the elective requirement.

IV. If a student does not select ROTC as a major or minor, ROTC credits may, at the discretion of the college and the department, be applied toward the elective requirement.

IV. In the College of Engineering a student may elect the Officer Education specialization in Engineering Operations. In the curriculum up to 14 hours of ROTC credits can normally be applied toward the elective group requirements. See Engineering Operations, Curriculum.

For specific courses and programs see also Air Force Aerospace Studies, Military Science, and Naval Science.

Pest Management

Larry P. Pedigo, Chairman, Advisory Committee

Professors: McNab, Moorman, Pearce, Pedigo, Stanforth, Tipton

Associate Professors: Domoto, Hall

Assistant Professor: Mertins

The pest management program is designed for students with a career interest in the science and technology of pest control. Students in the program conduct interdisciplinary studies with plant diseases, insects, weeds, and other pests, emphasizing the development of control systems that are ecologically and economically sound. The interdisciplinary nature of the program is reflected in the departmental sponsors — Agronomy; Animal Ecology; Biochemistry and Biophysics; Botany; Plant Pathology; Seed, and Weed Sciences; Entomology; Forestry, and Horticulture.

Pest management is an undergraduate secondary major that may be taken only in conjunction with a primary major. For example, the student may wish to take a primary major in agronomy, forestry, entomology, or some other life science and use elective credits to satisfy the requirements of the pest management major. Students educated in pest management may find employment opportunities with governmental agencies (state and federal), agricultural chemical companies, food-processing firms, consulting agencies, timber companies, and other concerns which produce, process, and market the nation's food and fiber.

Students wishing to enroll in the pest management curriculum must register with the chairman of the advisory committee. After consultation with the chairman, a pest management adviser will be assigned, depending on the interests of the student. The student should indicate interest in pest management as early as possible in order that requirements of the program be effectively integrated with those of the primary major.

Courses Primary for Undergraduate Students

216. Weed Identification and Management. (PP SW 216) See Plant Pathology, Seed, and Weed Sciences

225. Formulation and Application of Pesticides. (HORT 225) See Horticulture


407. Principles of Plant Pathology. (PP SW 407) See Plant Pathology, Seed, and Weed Sciences

416. Forest Pest Management. (PP SW 416) See Plant Pathology, Seed, and Weed Sciences

418. Weed Control with Herbicides. (PP SW 418) See Plant Pathology, Seed, and Weed Sciences.

490. Independent Study. Cr 1 to 3 Pre Req: 3 credits in pest management, permission of instructor and written plan of study approved by pest management curriculum chairman.

491. Pest Management Experience. Cr 2 to 4 Pre Req: 6 credits in pest management, permission of instructor.

Practical experience (internship) in management of plant diseases, insect populations, weeds, and other pests. Diagnosis, problem assessment, and control procedures are emphasized. For majors and advanced students.


Philosophy

John W. Elrod, Chairman of Department

Professors: Klemke, Van Iten

Emeritus Professor: Shideler

Associate Professors: Elrod, Hollenbach, Holling, Kupfer, Robinson, Solomon

Assistant Professors: Kline, Luguard, Smith

Undergraduate Study

See Sciences and Humanities, Curriculum, for the undergraduate curriculum in sciences and humanities, with major in philosophy, leading to the degree Bachelor of Arts.

The major in philosophy offers study in the important ideas, values, and ways of thinking that underlie cultural, social, and political processes, and that direct the specialized search for knowledge. Philosophical study broadens the student's educational experience and facilitates more effective participation in the human community.

An undergraduate major in philosophy should have a broad background in the sciences and humanities. The major program includes both a core and electives to provide a thorough acquaintance with the history of philosophy and further concentration in historical and systematic issues. An undergraduate major in philosophy can prepare the student for graduate work in philosophy, and also for further study in law, history, theology, religion, political science, social and political theory, or literature.
The degree program in philosophy requires a minimum of 24 credits in the core program and, for those not concentrating in religious studies, 6 credits of electives chosen from the remaining courses listed in the 300 or 400 levels. The following courses compose the basic core program of the department from which 24 credits shall be chosen:

- a. Introduction, 201 (required)
- b. Ethics 230 (required)
- c. Logic 207 (required)
- d. Aesthetics, philosophy of law, political philosophy, philosophy of religion and philosophy of science. The core course required is chosen from 332, 335, 340, 350, 380, or 381.
- e. History: two courses required, chosen from 310, 311, 312 and 313 (must be taken for 4 credits each)
- f. Seminars 430, 460, and 470 (two seminars required)

For those philosophy majors desiring a more enriched preparation in philosophy, Intensive Studies in Philosophy is offered. Completion of this program will be formally recognized and serve as an addition to recommendation for further study. Admission to this program requires the permission of the advisor and the chairman of the department. For further information regarding the details of this program, see the department chairman.

Religious Studies
A major in philosophy may be combined with a concentration in religious studies. Requirements for this option are the same as above with the following exceptions:

- a. Philosophy of Religion, 350, is required
- b. The two required seminars must be Religious Studies 465 and 475

For course descriptions and other programs in religious studies see Religious Studies.

Graduate Study
The department offers courses for graduate minor work in philosophy and participates in the interdepartmental programs in General Graduate Studies and Technology and Social Change. (See Index.)

Courses open to graduate students for minor credit only: 310, 311, 312, 313, 320, 332, 335, 340, 350, 380, 381, 430, 460, 470, 590

Courses Primarily for Undergraduate Students

- 201. Introduction to Philosophy (3-0) Cr 3 or (3-1) Cr 4 F S SS. Introduction to the principles of reasoning and argumentation. Emphasis on elementary deductive and inductive arguments and on principles of scientific method. Common fallacies in reasoning. Uses and abuses of language. Application of the principles of logic and argumentation to contemporary issues.
- 203. Introduction to Symbolic Logic (3-0) Cr 3 S S SS. Introduction to fundamental logical concepts and logical symbolism. Development of natural deduction through first order predicate logic with identity. Development of axiomatic logic through completeness of propositional logic. Applications to arguments in ordinary English and to philosophical issues.
- 204. Philosophy of Science (3-0) Cr 3 or (3-1) Cr 4 F F S SS. Contemporary and historical views of the nature of science. Major philosophical issues in the philosophy of science. A variety of basic problems common to the natural and social sciences. The nature of explanation, the structure of theories, and the distinction between science and non-science.
- 205. Philosophy of Religion (Relg 350) (3-0) Cr 3 or (3-1) Cr 4 S S SS. Theology and philosophy of religion. Historical and contemporary readings from both the western and eastern traditions.

400. Seminar: Epistemology and Metaphysics. (3-0) Cr 3 each time taken, maximum of 6 credits. Fall, offered 1981. Prerequisite: 201 and at least one course in the history of philosophy. Focus upon philosophical systems and analysis of several philosophers forming a tradition or school. Each student will write a comprehensive paper.

460. Seminar: Philosophical Systems. (3-0) Cr 3 each time taken, maximum of 6 credits. Fall, offered 1982. Prerequisite: 201 and at least one course in the history of philosophy. Focus upon philosophical systems and analysis of several philosophers forming a tradition or school. Each student will write a comprehensive paper.

Philosophical Education and Leisure Studies

Barbara E. Forker, Head of Department

Professor: Forker, Menzie, Nichols, Schneider, Toman

Emeritus Professors: Grant, Schmidt, Timm

Associate Professors: Conover, Cooney, Gagner, Hutchinson, Kyoguchi, Mathes, Pease, Puhl, Rupnow, Sutherland, Wood

Assistant Professors: Dean Anderson, Beran, Bergan, Duncan, Flattet, Gearhart, Keenan, McCullough, McDonald, McLean, Metzler, Murdoch, Orr, Schabel, Steel, Symons


Undergraduate Study

Health Studies. The introductory courses in health studies offer opportunities for learning experiences in personal and community health, and emergency health care. Students interested in teaching may qualify to teach health education. (See College of Education, Requirements of Areas of Specialization in Teacher Education.) Students seeking preparation in the health education area should contact the department for program advisement.

Dance. Course work in dance provides opportunities for students to develop an understanding and appreciation of dance as part of a liberal education. Those interested in teaching dance and physical education in the public schools may major in physical education with an option of specialization in dance. An individualized noncertification program in dance is also available through the Department of
The normal prerequisite to major graduate work is the satisfactory completion of a curriculum essentially equivalent to that required of undergraduate students in physical education at this University. However, it is possible for students to qualify for graduate study even though undergraduate preparation has been in a related area.

A student in the graduate program may select either a thesis or non-thesis option. Specific information about the requirements for either degree option is available from the departmental office.

Courses open to graduate students for minor credit only: L S 355, 453, 494, P E 355, 370, 390, 392, 455, 475

Courses Primarily for Undergraduate Students

Athletics (Ath)

99. Athletic Conditioning, Cr. 0 S. Conditioning program for sports participants. Open to all students.

*100. Interscholastic Athletics. Cr. 1 in any one semester. Limited to 1 credit per year to a maximum of 4. F S. Prereq: Parent or head coach.

A. Baseball (men)
B. Basketball (men)
C. Basketball (women)
D. Cross Country (men)
E. Cross Country (women)
F. Football (men)
G. Golf (men)
I. Gymnastics (men)
J. Gymnastics (women)
K. Softball (men)
L. Swimming/Diving (men)
M. Swimming/Diving (women)
N. Tennis (men)
O. Tennis (women)
P. Track and Field (men)
Q. Track and Field (women)
R. Volleyball (women)
S. Wrestling (men)
T. Golf (women)

*Credit in a sport section of Ath 100 and a beginning level skill-activity course in the same sport may not be applied toward graduation.

Leisure Studies (L S)

100. Orientation to Leisure Studies. (1-0) Cr. 3 F S. Professional preparation for the leisure services field. Open to leisure studies majors only. Offered on a satisfactory-fail basis only.

201. Leisure and Recreation: Concepts and Services. (3-0) Cr. 3 F S. Concepts of leisure and recreation, historical development, the park and recreation movement in the United States, the professional field of service.

283. Introduction to Professional Services. (1-3) Cr. 2. F S. Prereq: 100. Credit or classification in 201. Open to leisure studies majors only; advance reservation required. Orientation, selection, and observation of leisure services agencies and programs. Demonstration and practice of basic leadership techniques. Offered on a satisfactory-fail basis only. Fee for field trips.

300. Leadership, Services, and Programs. (2-4) Cr. 4. F S. Prereq: 283. Principles and practices in park and recreation leadership, program development, services, and community organization for leisure. Fee for field trips.

351. Outdoor Recreation: Concepts and Practices. (2-0) Cr. 2. F S. Prereq: 201. Introduction to concepts and practices of outdoor recreation including historical development, governmental and private involvement, research, participant behavior, legislation, and economics. Fee for field trips.

355. Dimensions of Recreation in the Campus Community. (3-0) Cr. 3 F S. Prereq: 350. Basic concepts in organization, administration, and program planning for recreation in the campus community.

383. Practicum in Leisure Services. (0-6) Cr. 2. F S SS. Practicum 283, 350. Open to leisure studies majors only; advance reservation required. Observation and practice in established leisure programs and services of selected agencies.
Instructor, advance registration required

Prerequisite: 220

Recreational skills to physical education

Modean dance as a form of movement education

Concepts within the Jazz and practice in basic tap technique routines in strength, balance, and endurance. Some repertory

Terminology, stage directions, choreography and performance

Independent study. Cr Var FP Advance permission required.

*Credit for both 275 and 375 may not be applied toward graduation.

**Dance (Dance)

115. American Ballroom Dance. *(0-2) Cr 5 F S

Instruction and practice in foxtrot, waltz, swing, and selected fast dances

116. Latin and Contemporary Social Dance. *(0-2) Cr 5 F S Instruction and practice in cha cha, rhumba, tango, and selected contemporary dances

117. Folk Dance. *(0-2) Cr 5 F S Instruction and practice in various international folk dances

118. Square Dance. *(0-2) Cr 5 F S Instruction and practice in the fundamentals of square dance

120. Modern Dance I. *(0-3) Cr 1 F S Introduction and practice of basic dance concepts, including preparatory techniques and guided creativity problems

130. Ballet I. *(0-3) Cr 5 F S Introduction to the basic skills, vocabulary, and tradition of ballet with concentration on control and proper alignment

131. Ballet II. *(0-3) Cr 5 F S, PreReq. Dance 130. Designed to expand the vocabulary and proficiency in beginning ballet techniques.

132. Ballet III. *(0-3) Cr 1 PreReq Dance 131 Concentration on technical proficiency at the intermediate level of a classical movement vocabulary

135. Jazz I. *(0-3) Cr 5 F S Introduction to the modern jazz style with concentration on isolation and synchronization

136. Jazz II. *(0-3) Cr 5 PreReq Dance 135 Dance concepts within the jazz idiom. Instruction in extended movement sequences including turns and aerial work

137. Introduction to Tap Dance. *(0-3) Cr 5 Instruction and practice in the fundamentals of tap dance techniques. Emphasis on rhythm and phrasing.

138. Introduction to Tap Dance. *(0-3) Cr 5 Instruction and practice in the fundamentals of tap dance techniques. Emphasis on rhythm and phrasing.

140. Modern Dance Composition I. *(1-3) Cr 2 S PreReq. Dance 120 or 130. Introduction to the creative skills involved in solo and small group composition

220. Modern Dance Composition II. *(0-3) Cr 1 S PreReq. Dance 120 or 130. Instruction in intermediate dance techniques, including aerial work and extended combinations.

222. Modern Dance III. *(0-3) Cr 1 S PreReq. Dance 222 Practice in advanced dance techniques, emphasizing strength, balance, and endurance. Some repertory work

224. Concert and Theatre Dance. *(0-3) Cr 2 to 5, cr. by instructor. Cr PreReq. By audition only. Choreography, rehearsal, and performance in campus dance concerts and/or musical theatre productions. Offered on a satisfactory-fail basis only

270. Dance Appreciation. *(0-2) Cr 2 F Introduction to dance appreciation, emphasizing ability to analyze and appreciate various dance styles. No dance experience required

280. Sound and Movement. *(0-3) Cr 2 S PreReq. 220 Creating sounds in relation to improvised movement

**Improved accomplishment and suggestions for sound compositions

360. History and Philosophy of Dance. (3-0) Cr 3 Alt S, offered 1962. PreReq. 270 Study of the history of dance from early to modern times with emphasis on the theories and philosophies of contemporary modern dance, dancers, and dance educators

370. Advanced Studies in Dance. Cr 1 to 3 in any one semester to a maximum of 6 credits. F S PreReq. 2 credits in dance.

Advanced courses designed to meet special interests and talents of students to include both group and independent study in various aspects of dance as a performing art including production, choreography, and performance

371. Elementary Labanotation. *(2-0) Cr 2 Fundamentals of basic labanotation (movement writing) with emphasis on reading and performing notated movement sequences. Movement concepts. Principles may be applied to any type of movement, but primary emphasis is on notation and reading dance composition

385. Teaching Modern and Recreational Dance. *(1-3) Cr 2 F S PreReq. 115, 117, 190, and P 167. Methods and techniques of teaching recreational and modern dance forms

386. Teaching Dance Technique and Composition. *(1-3) Cr 2 Alt S, offered 1983. PreReq. 385 Teaching of dance as an expressive art form with emphasis on technique, rhythm, and the creative teaching process

400. Independent Study. Cr Var PreReq. Advance permission. Independent study of problems or areas of interest in dance

**Physical Education (P E)

101. Swimming I. *(0-3) Cr 1 F S Basic course for beginning swimmers. Emphasis on basic strokes, personal safety, and deep water skills. Fee

102. Swimming II. *(0-3) Cr 1 F S PreReq. 101 or equivalent skill. Intermediate course. Emphasis on 4 basic strokes, plus back crawl and trudgen course. Fee

103. Swimming III. *(0-3) Cr 1 F S PreReq. 102 or equivalent skill. Perfection of all strokes. Emphasis on the 10 styles of swimming, plus advanced swim skills. Fee

105. Springboard Diving. *(0-3) Cr 1 F S PreReq. 102 or equivalent skill. Fee

107. Synchronized Swimming. *(0-3) Cr 1 PreReq. 102 or equivalent skill. Fee

108. Aquatic Fitness. *(0-3) Cr 1 PreReq. 101 or equivalent skill. Emphasis on water exercises, activities, and programs to improve physical fitness. Fee

109. Basic Skin and Scuba Diving. *(1-2) Cr 1 F S PreReq. Swimming competence fee

110. Advanced Scuba Diving. *(1-2) Cr PreReq. 109 Fee

111. Certified Scuba Diving. *(1-1) Cr PreReq. 109 Fee

112. Scuba Assistant Instructing Training. *(0-2) Cr PreReq. 111 or Scuba Diving Certification. Emphasis on skill analysis, safety skills, dive planning, teaching techniques, and legal aspects of instruction. Fee

113. Scuba Assistant Instructor PreQualification *(0-2) Cr PreReq. 112 or 113. Supervised experience in conduct of basic scuba diving program Offered on a satisfactory-fail basis only Fee

114. Life Saving. *(0-5) Cr 2 F S PreReq. Ability to swim 500 yards continuously of front crawl, sidestroke, and breaststroke. Perform a treading and surface dive, swim underwater, and tread water for one minute. Minimum age 15 Red Cross Certification Fee

115. Water Safety Instructor. *(0-3) Cr 2 F S PreReq. Minimum age 17, current American Red Life Saving Certificate. Swimming and water safety skills, stroke analysis, methods of class organization and instruction, and Red Cross certification Fee

116. Camping. *(0-3) Cr 5 F S PreReq. Ability to stay alert 10 minutes in deep water while clothed

117. Sailing. *(0-3) Cr 5 F S PreReq. Sailing competence Fee

118. Water Polo. *(0-3) Cr PreReq. 102 or equivalent skill

**Designates 8-week classes.

119. Archery I. *(0-3) Cr 5 F S Fee

120. Archery II. *(0-3) Cr 5 F S PreReq. 119 or equivalent skill. Fee

121. Bagiminton I. *(0-3) Cr 5 F S

122. Bagiminton II. *(0-3) Cr 5 F S PreReq. 121 or equivalent skill

123. Ballooning. *(0-3) Cr 5 F S

126. Pocket Billiards I. *(0-2) Cr 5 F S, introduction to the basic strokes (stop, draw, follow) and contemporary game forms associated with pocket billiards. Fee

127. Pocket Billiards II. *(0-2) Cr 5 F S PreReq. 126 or equivalent. Use of basic strokes in more advanced game forms. Fee

128. Bowling I. *(0-2) Cr 5 F S Fee

129. Bowling II. *(0-2) Cr 5 F S PreReq. 128 or equivalent Fee

130. Fencing. *(0-3) Cr 5 F S Fee

131. Golf I. *(0-3) Cr 5 F S PreReq. Beginning skills only. Fee

132. Golf II. *(0-3) Cr 5 F S PreReq. 135 or equivalent skill. Fee

133. Golf III. *(0-3) Cr 5 F S PreReq. 136. Emphasis on individual error correction and practice in the advanced skills of golf. Study of comprehensive rules which apply to competitive play. Fee

137. Gymnastics I. *(0-3) Cr 5 F S

140. Gymnastics II. *(0-3) Cr 5 F S PreReq. 139 or equivalent skill

143. Handball. *(0-3) Cr 5 F S

144. Racquetball. *(0-3) Cr 5 F S

145. Target Riffle. *(0-2) Cr 1 F S Fee

149. Snow Skiing I. *(0-3) Cr 5 F S Fee

150. Snow Skiing II. *(0-3) Cr 5 S PreReq. 148 or equivalent. Fee

151. Cross Country Skiing. *(0-3) Cr 5 F S Fee

153. Ice and Figure Skating. *(0-3) Cr 5 F S Fee

155. Ice Hockey I. *(0-3) Cr 5 F S Fee

156. Ice Hockey II. *(0-3) Cr 5 S PreReq. 155 or equivalent Fee

159. Tennis I. *(0-3) Cr 5 F S PreReq. 159. Beginning course. Fee

160. Tennis II. *(0-3) Cr 5 F S PreReq. 160 or equivalent. Expansion of basic skills to include volley and spins. Introduction to basic strategy. Fee

166. Tennis III. *(0-3) Cr 5 F S PreReq. 159 or equivalent. Introduction to more advanced skills (top overhead, and spin serves) Fee

169. Tennis IV. *(0-3) Cr 5 F S PreReq. 159 or equivalent. Introduction to more advanced skills (top overhead, and spin serves) Fee

171. Tae Kwon Do. *(0-3) Cr 5 F S PreReq. 171 or equivalent. Fee

172. Self-Defense. *(0-3) Cr 5 F S Basic elements of self-defense

173. Fall KI Do/Martial Self-Defense. *(0-3) Cr 5 F S Fee

174. Yoga. *(0-3) Cr 1 F S Fee

175. Bicycling. *(0-3) Cr 5 F S Fee

180. Swimming Skills. *(0-3) Cr 5 F S PreReq. 112. Swimming Skills in outdoor cookery, firebuilding, and orienteering. Study of equipment, weather influences, protection of natural resources, and the use of native materials. Fee

187. Horseback Riding. *(0-3) Cr 5 F S PreReq. No former experience in occupation. Basic horseback riding, knowledge, and practice in riding skills. Fee

189. Basketball. *(0-3) Cr 5 F S Fee

190. Flag Football. *(0-3) Cr 5 F S Fee

191. Softball I. *(0-3) Cr 5 F S Fee
181. Softball II. (0-3) Cr 5 F S Prereq 180 or equivalent skill.

182. Volleyball I. (0-3) Cr 1 F S

183. Volleyball II. (0-3) Cr 5 S Prereq 182 or equivalent skill

184. Fundamentals of Combatives. (0-3) Cr 1 F S For physical education majors only

185. Rhythmic Aspects of Movement. (0-3) Cr 1 F S Study and practice of the rhythmic structure inherent in movement activities. Physical education majors only

186. Fundamentals of Anatomy. (0-3) Cr 5 F S Physical education majors only Fee

187. Fundamentals of Golf. (0-3) Cr 5 F S Physical education majors only Fee

191. Fundamentals of Tennis. (0-3) Cr 5 F S Physical education majors only Fee

192. Fundamentals of Wrestling. (0-3) Cr 5 F S Physical education majors only

193. Fundamentals of Basketball. (0-3) Cr 5 F S Physical education majors only

194. Fundamentals of Soccer and Speedball. (0-3) Cr 5 F S Physical education majors only

195. Fundamentals of Track and Field. (0-3) Cr 5 F S Physical education majors only

196. Fundamentals of Volleyball. (0-3) Cr 5 F S Physical education majors only

197. Fundamentals of Gymnastics. (0-3) Cr 1 F S Physical education majors only

198. Fundamentals of Fitness and Conditioning. (0-3) Cr 1 F S Physical education majors only

*Designates 9-week classes

Programs of Professional Courses

201. Techniques of Baseball. (0-5) Cr 2 Fundamentals of pitching, catching, batting, baserunning, infield and outfield play. Designed for the student seeking the coaching endorsement

202. Techniques of Basketball. (0-5) Cr 2 Fundamentals of basket shooting, passing, ball handling, and footwork with offensive and defensive patterns. Designed for the student seeking the coaching endorsement

203. Techniques of Football. (0-5) Cr 2 Fundamentals of offensive and defensive line and backfield play, forward passing and kicking skills. Designed for the student seeking the coaching endorsement

209. Officiating Baseball/Softball. (0-3) Cr 1 S Rules, interpretation, techniques and mechanics of officiating baseball and softball. Practical experience gained through officiating in the intramural program

210. Officiating Basketball. (0-3) Cr 1 F S Rules, interpretation, techniques and mechanics of officiating men's and women's basketball. Practical experience gained through officiating in the intramural program

211. Officiating Volleyball. (0-3) Cr 1 F S Rules, interpretation, techniques and mechanics of officiating volleyball. Practical experience gained through officiating in the intramural program

212. Officiating Wrestling. (0-3) Cr 1 Rules, interpretation, techniques and mechanics of officiating wrestling. Practical experience gained through officiating in the intramural program

220. Athletic Training for Coaches. (1-2) Cr 2 Prereq Zool 156 Introduction to methods of prevention and improvement of athletic injuries. Basic information concerning health supervision of athletes, and some basic wrapping and strapping techniques for common injuries. Fee

225. Introduction to Athletic Training. (2-2) Cr 3 Prereq 163 or 198, S 105, Zool 156 Qualifications, opportunities, preparation, and duties of athletic trainers. Introduction to the establishment and operation of the athletic training room and the role of the trainer in the prevention, treatment and reconditioning of athletic injuries. Practical application of basic wrapping and strapping techniques.

250. Physical Education Orientation. (1-0) Cr 1 F S Orientation to various aspects of physical education and assistance in learning how to use facilities of the university and department. Offered on a satisfactory-fail basis.

260. History and Philosophy of Physical Education. (3-0) Cr 3 F S Development of physical education from Greece to modern times

270. Perspecives of Physical Education. (0-2) Cr 1 F S Nature and functions of physical education as a profession. Physical education majors only

275. Movement Education in Elementary School Physical Education. (2-3) Cr 1 F S Study of movement experiences appropriate for the primary and intermediate grade child. Focuses on activities that develop physical and motor fitness and awareness of the self in relation to the environment and others. Designed for physical education majors.

280. Directed Field Experience in Elementary School Physical Education. (0-3) Cr 1 S Prereq 275 Observing, planning, and facilitating movement experiences of children in an elementary school setting

284. Elementary and Pre-school Movement Education. (2-3) Cr 1 F S Study of movement opportunities appropriate for the primary and intermediate grade child. Approaches to teaching movement skills to pre-school and elementary school children. Emphasis on planning appropriate learning environments to help children develop perceptual-motor and fundamental movement skills as well as a positive self-concept. Practical experience provided through participation in a children's movement program.

295. Supervised Practicum in Teaching. (0-3) Cr 1 Prereq 270 Opportunity to observe and participate as an instructional assistant in physical education classes. Offered on a satisfactory-fail basis only

301. Coaching Baseball. (1-0) Cr 1 Prereq 201 or equivalent skill, Psych 230

302. Coaching Basketball. (1-0) Cr 1 S Prereq 202 or equivalent skill, Psych 230

303. Coaching Football. (1-0) Cr 1 Prereq 203 or equivalent skill, Psych 230

304. Coaching Golf. (1-3) Cr 2 Alt. S offered 1983 Prereq 135 or equivalent skill. Psych 230

305. Coaching Gymnastics. (1-3) Cr 2 Prereq 140 or equivalent skill, Psych 230

306. Coaching Softball. (1-3) Cr 2 Prereq 181 or equivalent skill, Psych 230

307. Coaching Swimming. (1-3) Cr 2 Prereq 103 or equivalent skill, Psych 230

308. Coaching Tennis. (1-3) Cr 2 Alt. S offered 1982 Prereq 160 or equivalent skill. Psych 230

309. Coaching Track and Field. (1-0) Cr 1 Prereq 209 or equivalent skill, Psych 230

310. Coaching Volleyball. (1-3) Cr 2 Prereq 183 or equivalent skill, Psych 230

311. Coaching Wrestling. (1-3) Cr 2 Prereq 174 or equivalent skill, Psych 230

312. Coaching Ice Hockey. (1-2) Cr 2 Alt. S offered 1982 Prereq 156 or equivalent skill, Psych 230

325. Advanced Athletic Training. (0-5) Cr 2 Alt. S offered 1982 Prereq 150 or equivalent skill. Psych 230

340. Advanced Athletic Training 2. (0-5) Cr 1 F S Prereq Zool 156, Phys 101 or 106, Psych 101 or 106. The study and mechanical phenomena which underline human motor performance. Includes the application of kinesiological concepts to a wide variety of athletic activities.


375. Teaching Physical Education. (2-3) Cr 3 F S Prereq 370 Principles and current practices of teaching physical education

380. Teaching Gymnastics. (0-3) Cr 1 Prereq 198 Methods and techniques of teaching gymnastics

382. Basic Aquatic Methods. (0-3) Cr 1 Prereq 101 Basic elements of swimming techniques; pool safety, survival and rescue techniques, and related aquatic activities. Physical education majors only

384. Teaching Children's Dance. (1-3) Cr 2 Prereq 187, 275, Dance 190 Content, experiences, and methods of teaching dance program at the elementary school level. Theories and practice in guiding elementary school children in expressive movement experiences

390. Physical Education for the Developmentally Disabled. (2-2) Cr 2 Prereq Psych 230 Psychology, incidence, and characteristics of the developmentally disabled, and resulting implications for physical education. Emphasis on adaptation of activities, methods, and program planning. Observation opportunities available

392. Physical Education for the Physically Disabled. (1-2) Cr 2 S Prereq. Psych 230 Organization of an adapted physical education program. Study of specific disabling conditions in terms of etiology, description, and potential for movement and activity. Activities and specific exercises aimed at the rehabilitation of the individual.

394. Adapted Aquatics. (0-3) Cr 1 Prereq Current water safety instructor certification. Background information and techniques for teaching swimming to physically handicapped and mentally retarded individuals. Laboratory experiences in the pool. Red Cross certification Fee

395. Adapted Physical Education. (2-3) Cr 3 Prereq 375 Specific disabling conditions in terms of etiology, characteristics, and potential movement experiences. Techniques of assessment, prescription, adaptation of activities, methods, and program planning. Laboratory experience required. Physical education majors only

402. Psychological and Administrative Issues in Interscholastic Athletics. (3-0) Cr 3 Prereq Psych 230 Current problems and practices in coaching interscholastic athletics. Organization, administration, psychological, and ethical considerations. Not acceptable for credit toward a major in physical education


418. Supervised Teaching in Physical Education in the Elementary School. Cr Var. F S Prereq 280, 384 Supervised teaching in the elementary schools. Advance registration required. Offered on a satisfactory-fail basis only

425. Athletic Training Modalties and Rehabilitation. (1-3) Cr 2 Alt. S offered 1983 Prereq 225, 230, permission of instructor. The study of athletic training modalities and rehabilitation in the management of athletic injuries

455. Physiology of Exercise. (2-3) Cr 3 F S Prereq Zoool 156 Physiological basis of human performance. Effects of physical activity on body functions

470. Evaluation in Physical Education. (2-3) Cr 3 F S Prereq Senior classification. Principles underlying process of evaluation. Selected test and measurement procedures and tools within the field of physical education

475. Physical Education Curriculum Design and Program Organization. (3-0) Cr 3 F S Prereq 375 Current practices and principles applied to curriculum development and to problems of organization and administration of instructional and extracurricular programs in physical education

486. Supervised Coaching in Interscholastic Athletics. Cr Var. F S Prereq 220, 1 credit from course P E 301-312 Advanced registration required. Offered on a satisfactory-fail basis only

488. Practicum in Athletic Training. Cr 1 to 4 Prereq Permission of instructor. Experience in application of theoretical principles and techniques under supervision of certified athletic trainers. Offered on a satisfactory-fail basis only

490. Independent Study. Cr Var. Independent study of problems of areas of interest in physical education and related areas. Advance permission required
Physics

Clayton A. Swenson, Chair of Department


Emeritus Professors: Carr, Earls, Jensen, Kirkham, Legvoid, Spedding

Associate Professors: Anderson, Beavers, Cook, Crawley, Harmon, Hill, Leacock, Parker, Peterson, Ross, Vay, Willson, Wohin

Assistant Professors: Dixon, Klemm, Lewis, Nolan, Roselton, Shellen, Staudennahm

Undergraduate Study

For the undergraduate curriculum in sciences and humanities, major in physics, leading to the degree Bachelor of Science, see Sciences and Humanities, Curriculum

Physics and astronomy are basic natural sciences that attempt to describe, and provide an understanding of, our universe. The study of physics is an enlightening starting point for understanding many different disciplines. Students may choose physics as their major subject not only as a preparation for a career as a professional physicist or high school teacher, but also as a challenging approach to personal development or as preparation for such diverse areas as business administration, law, medicine, and others. Although many opportunities exist for men and women who terminate their studies with a bachelor's degree, students who meet the necessary scholastic standards often continue their studies in a graduate college where opportunities exist to explore and contribute to the most recent developments in the field.

The department normally expects each student majoring in physics to complete at least the following courses: Phys 221, 221L, 222L, 321, 321L, 322, 322L, 304, 361, 364, 398, and one of 311, 311T, or Astro 344L. This is not a rigid requirement, however, and changes in that basic list will be approved by the departmental curriculum committee on recommendation of the student's advisor when these will better serve the individual's needs. In particular, students planning a physics major and also seeking certification for high school teaching may, with the approval of their advisor, follow a significantly different program designed to meet their special needs. Students should consult the department for further information. In any case each student must earn at least 7 credits in laboratory work, either in the courses listed above or in approved substitutions, and must earn at least 20 credits in physics and astronomy in courses numbered 304 or higher.

Students wishing an emphasis in astronomy or astrophysics should add Astro 344-345 to the above list of courses and should take Astro 344L. Well qualified students may also include some 500-level astronomy courses. Those planning graduate work in physics, astronomy, or astrophysics should add Phys 365, 396, 480, and 481 to the basic course list; they are encouraged also to add one or more of Phys 511, 524, and 537, according to the areas of special interest. Students planning graduate work are also strongly encouraged to study at least one foreign language. Further information concerning programs of study, including sample degree programs, is available from the department.

Graduate Study

The department offers work for the degree Master of Science and for the degree Doctor of Philosophy with majors in physics, astrophysics, high energy physics, nuclear physics, and solid-state physics, and minor work to students majoring in other departments.

Facilities of the department and in the Ames Laboratory are available for both theoretical and experimental research.

Students with bachelor's degrees in physics or astronomy from other institutions ordinarily will qualify for graduate study here provided they have satisfactorily completed course work similar to that suggested for undergraduate physics majors at this University. In some cases, additional instruction at the intermediate level may be required.

The degree Master of Science in physics is offered both with and without thesis. In either case, the basic requirements are the same. At least 50 credits of acceptable graduate work must be completed, not less than 21 of which must be in physics or astronomy and not less than 5 from the formal department or in areas different from the student's major area. At least 15 of the credits in physics must be in courses at the 500 or 600 level exclusive of 595 and 699. Students choosing a degree without thesis may apply up to 8 credits of 699 but no credits of 595 toward the minimum 30 credits. Students choosing a degree without thesis should apply 1 credit per semester of 595, up to 2 credits, but may not apply any credits of 699 toward the minimum 30 credits.

Each candidate for the Doctor of Philosophy degree is required to teach one year of elementary physics. In addition to course work in the major area a candidate must take 12 minor credit hours outside this area, not less than 6 of which must be from other departments.

The Physics Department cooperates in the interdisciplinary minor in Technology and Social Change (See Technology and Social Change).

Open for graduate minor credit only. Phys 304, 311, 361, 364, 385, 396, 447, 480, 481, and Astro 344, 344L, 345

Astronomy and Astrophysics (Astro)

Courses Primarily for Undergraduate Students

120. The Sky and the Solar System. (3-0) Cr. 3
F S
Designed for the nonscientist. The sky constellations, motions of the sun, moon, and planets; seasons and the calendar; eclipses; The solar system origin and evolution, characteristics of the sun, planets, satellites, comets, meteorites, results of recent space probes. Extensive use of the planetarium is included.

150. Stars, Galaxies, and Cosmology. (3-0) Cr. 3
F S S
Designed for the nonscientist. Observational aspects of stellar structure, distances, sizes, spectra, types of stars; variability, binary systems. Stellar evolution: the birth, life, death, and death of stars, including supernovae, neutron stars, and black holes. The Way We Know the Universe. The structure and evolution of our galaxy. Other galaxies: clusters of galaxies, quasars. Theories of the origin of the universe.

290. Independent Study. Cr. 1 to 4 each time taken. Prereq: Permission of Instructor.

344, 345. Introductory Astrophysics. (3-0) Cr. 3 each. Yr
Prereq: 344. Phys 222, 345; 344 344: The solar system.
344L, Astronomy Laboratory (0-6) Cr 3 F Prereq: Credit in 344L and permission of instructor 450 Research under supervision of astronomy faculty 450L, Laboratory or observational project under supervision of astronomy faculty 490, Independent Study, Cr 1 to 4 each time taken Prereq: Permission of instructor 6 Honors Courses Primarily for Graduate Students, major or minor open to qualified undergraduates 510. Observational Astrophysics (1-4) Cr 3 Alt F, offered 1981 Prereq 345 Techniques of astronomical data acquisition, analysis, and interpretation as applicable in studies in photometry, spectroscopy, binary stars, parallel, and proper motion. Observing projects for gaining proficiency in the use of astronomical telescopes, instruments, and coordinate systems 513. Radio Astronomy and Astrophysics (E E 518) (3-0) Cr 3 Alt S, offered 1992 Prereq EE 313 Radio astronomy fundamentals, wave polarization and measurement, radio telescopes receivers and antennas, wave propagation in plasmas, synchrotron emission, continuum and line spectra, physical conditions in radio sources 520. Galactic and Extragalactic Astronomy (3-0) Cr 3 S Prereq 345S Phy 322 The interstellar medium, galactic structure, dynamics of external galaxies, evolution and classification of galaxies, extragalactic radio sources, quasars, cosmological models 520 L. Stellar Evolution and Nucleosynthesis (3-0) Cr 3 Alt S, offered 1983 Prereq 345S Phy 322 Solution of the equations of stellar structure, analytic approximations and theories relating to equilibrium stellar models, discussion of the results of numerical calculations of stellar evolution, nucleosynthesis in massive stars, final phases of stellar evolution, evolution of close binaries 558. Radiative Transfer, Stellar Atmospheres, and Spectroscopy (3-0) Cr 3 Alt F, offered 1982 Prereq 345S Phy 322 Basic methods of radiative transfer with applications to stellar interiors, stellar and planetary atmospheres. Theory and interpretation of astronomical spectroscopic line profiles. LTE and non-LTE line formation, interpretation of spectra observed at high resolution and low signal-to-noise ratios, model atmospheres, and curves of growth 590 Special topics, Cr var 595. Tutorial Astrophysics, Cr var Prereq Permission of instructor Individual directed study of research-level problems for students electing the nonthesis M S option in astronomy Courses for Graduate Students, major or minor 604L, Advanced Seminar, (1-0) Cr 1 each time taken F Topics of current interest in astronomy and astrophysics 606. Advanced Topics in Astronomy and Astrophysics Cr 1 to 3 each time taken. F Topics in stellar interiors and evolution, interstellar matter, stellar atmospheres, cosmology, solar physics, astronomical sources, and recent developments 699. Research Physics (Phys) Courses Primarily for Undergraduate Students 100. Introductory Seminar, (1-1) Cr 1. F, Survey of the principal areas of physics, both classical and modern, emphasizing the scope, methods, and goals of physics, and its relation to other fields of human activity 106. The Physics of Common Experiences, (4-2) Cr 4 F SS. Elementary topics from mechanics, heat, electricity, sound, and light, emphasizing the use of basic principles to understand everyday experience. Includes practical problem exercises and a coordinated laboratory 111, 112, General Physics, (4-2) Cr 4 each. 111 F SS, 112 SPR. 1 1/2 years of high school algebra, 1 year of geometry. 1 semester of trigonometry, 112 General background in physical concepts, principles, and methods for those who do not plan advanced study in physics or engineering. Applications related to the biological sciences 111 Mechanics, fluids, heat and thermodynamics. Vibrations, waves. 112 Electricity. and magnetism. wave optics, topics in modern physics 198. Physics of Music, (2-2) Cr 3 F Introductory-level course for nonphysicists. Properties of sound, human perception of sound, room acoustics, musical scales, production and analysis of musical sounds by voice, string, woodwind, brass, percussion, and electronic instruments 199. Physics of Sound Reproduction, (2-0) Cr 2 F Introduction to sound, the nature of sound, microphones, amplifiers, disc and tape signal storage and playback systems, speaker transducers, AM and FM transmission and reception 221. Introduction to Classical Physics I (5-0) Cr 5 S SS. Physics for engineering and science majors. Elementary mechanics, including kinematics and dynamics of particles, work and energy, linear and angular conservation laws, rotational motion, oscillations, gravitation, Electric forces and fields. Current electricity, DC circuits 221 L. Introductory Laboratory in Classical Physics I (3-0) Cr 1 F Prereq Credit or classification in 221 Experimental situation, energy oscillations, electric charge, and DC circuits. Computer simulation of physical systems. For physics majors and others seeking physics as a minor 222. Introduction to Classical Physics II (5-0) Cr 5 F Prereq 221, Math 166 or 175 Magnetic forces and fields, time-dependent electromagnetic fields, waves and sound, electromagnetic waves, ray optics and image formation, wave optics, heat, thermodynamics, kinetic theory of gases 222 L. Introductory Laboratory in Classical Physics II (3-0) Cr 1 F Prereq Credit or classification in 222 Experimental studies related to electrical circuits and circuit oscillations, magnetism, electromagnetic waves, light, and thermodynamics. For physics majors and others seeking strong emphasis in physics 224, Laboratory Survey of Classical Physics, (0-2) Cr 1 F Pre req 345S or 345S in 222 Experimental studies related to classical physics. Force, motion, energy, waves, electricity, magnetism, and optics. Measurements and theoretical predictions and the experimental basis of physical theories are emphasized through a series of laboratories 271, Physics, History, and Society I (Hist 271) (3-0) Cr 3 Alt F, offered 1981 Open to all undergraduates Examination of the assumptions upon which the scientific and humanistic traditions rest, and of their impact upon society. The physical concepts, theories, and experiments of Tycho, Kepler, Galileo, and Newton and their impact on society. The role of Koyre, Kuhn, and others are studied with respect to basic techniques, goals, and results in order to illuminate the nature of the sciences and the arts 272, Physics, History, and Society II (Hist 272) (3-0) Cr 3 F, offered 1986 Open to all undergraduates The lives and physical thinking of Einstein, Oppenheimer, and other physicists, emphasis on the theoretical, experimental, and technical aspects of special relativity. Historical analysis of the scientific background, development, and use of nuclear weapons, interaction of scientific and technological concepts with social structures. Scientific and historical methods and results are compared 290. Independent Study, Cr 1 to 4 each time taken Prereq Permission of instructor 302. The Challenge of Contemporary Physics, (3-0) Cr 3 S A largely nontechnical but intellectually challenging course which examines no previous work in the field. Selected material from classical and modern physics establishes the conceptual framework for study of a major area of contemporary physics, culminating in the discussion of topics at the frontier of present knowledge. Research topics vary from year to year and may include new particle physics, quantum mechanics, lasers, nuclear fission, liquid crystals, solid state devices, gravitational waves 304. Thermal Physics, (3-0) Cr 3 F Prereq 222, Math 266 or 371. Conservation of energy and entropy, other characteristic thermodynamic functions, with application to macroscopic properties of matter. The laws of thermodynamics, heat engines, efficiencies Kinetic theory and the velocity distribution. Introduction to statistical mechanics, including quantum statistics. Application to black body radiation, crystaline vibrations, magnetic ions in solids, electronic heat capacity of metals 311, 311T, Intermediate Laboratory (0-4) Cr 3 each time taken S L, 311T S Prereq 312 324 or 324 312T or 324 Experiments in classical and modern physics performed independently by each student Section 311T is for students preparing for a career in high school teaching 321. Introduction to Modern Physics I (3-0) Cr 3 S Pre req. 222, credit or classification in Math 266 or 371 Spectral line profiles and spectra line profiles. Fundamental particles. Quantum mechanics. The dual wave and particle character of electrons and photons, radioactive decay, and quantum mechanics 322. Introduction to Modern Physics II (3-0) Cr 3 F Pre req. 312 Electron spin, X-ray and optical excitations of multi-electron atoms, quantum statistics, lasers, physics of molecules. Properties of solids, including electrical structure, semiconductors and devices, superconductivity and magnetism. Nuclear physics, including nuclear sizes and masses, stability decay. Elementary particles. Including strangeness, charm, and quarks 323L, Introductory Laboratory in Modern Physics (0-1) Cr 1 F Prereq Credit or classification in 322 Experiments related to the foundations of modern physics The dual wave and particle character of electrons and photons, radioactive decay, and quantum mechanics 324 Elementary Modern Physics, (3-0) Cr 3 S Pre req 222, Math 266 or 371. For engineering and science majors. Special theory of relativity, wave particle nature of light and matter, quantum theory of atoms, nuclear physics 325. Elementary Solid State Physics, (3-0) Cr 3 S Pre req 222 Molecular and crystal binding, quantum theory of metals and semiconductors, physics of semiconductor junctions and transistors 331. Relativity, (2-0) Cr 2 S Pre req 222, credit or classification in Math 266 or 371 Introduction to special and general relativity, Lorentz transformation, the 4-vector space-time, relativistic kinematics. The physical foundations of general relativity, mental and gravitational mass, the equivalence principle, experimental tests of the general theory 350 Energy and the Environment, (3-0) Cr 3 S Pre req 112 or 222. An interdisciplinary approach to energy use, development, and conservation. Discussion of research, future energy alternatives, effects on environment 352. Energy Analysis of Residential Structures, (3-0) Cr 3 S Pre req 222 The architectural design and technical analysis of residential structures that emphasize energy conservation and solar energy utilization. Students work concurrently with Arch 468, and students from the two courses work as teams on design projects 361. Classical Mechanics, (4-0) Cr 4 F Pre req 222, Math 266 or 371 Newton's laws of motion, including linear forced oscillations, central forces and orbital motion, moving reference frames, Lagrange's equations, rotation of n-body systems, theory of small vibrations 364. Electricity and Magnetism I (3-0) Cr 3 S Pre req 222 Math 385 Electrodynamics, electromagnetism and relativity, magnetostatics, potential theory 365. Electricity and Magnetism II, (2-0) Cr 2 F Pre req 222. Time variation of electromagnetic fields, radiation, interaction with matter, interference and diffraction, waveguides and cavities 396, Optics, (3-0) Cr 3 S Pre req 327 or 324 Physical optics, interference, diffraction, scattering, polarization, coherence, topics in quantum optics
Courses for Undergraduate Students

110 Orientation in Plant Pathology. (1-0 Cr. F.) Required in plant pathology curriculum. Requirements and career opportunities in plant pathology and pest management.


237. Seed Production. (Agron 237) See Agronomy.

238. Seed Technology. (Agron 238) (0-6) Cr. 2 F. Prereq: Bot 109 or 110. Agron 114 Production, harvesting, quality evaluation, storage, and marketing of seeds. Fee for field trips.


408. Plant Disease Diagnosis. (P M 408) (3-0) Cr. 1 F. Prereq. Credit or classification in 407. Braun Laboratory experience in the diagnosis of plant diseases.

416. Forest Pest Management. (For 416, Ent 416, P M 416) (2 or 3-6) Cr. 3 or 5 S. Prereq. 8 credits in biological sciences, including Bot 207. McNabb. 3-credit course Nature of forest- and shade-tree pests. The diseases, pathogenic organisms, and agents of deterioration of wood products. Separate laboratory for students in resource management or forest products. 5-credit course. An additional lecture and management laboratory using integrated case studies and computer simulations in the evaluation and economic analysis of protection and pest management problems. Physical agents of tree damage. Weekend field trips. Fee for field trips.

418. Weed Control with Herbicides. (P M 418) (2-0) Cr. 2 S. Prereq 216, Bot 310 or 320. Stanforth Principles and practices of modern weed control with emphasis on herbicide chemistry, herbicide selectivity, mode of action, crop phytotoxicity, and the fate of herbicides in the environment, weed biology and ecology as related to the efficacy of herbicides.


490. Independent Study. Cr. 1 to 3 each time taken. Prereq: 7 credits in biological sciences, permission of instructor.

491. Seed Science Experience. Cr. 2 to 4. Prereq: 238, permission of instructor. Practical experience in the seed industry. For majors and advanced students.

Courses for Graduate Students, major or minor


580. Special Topics. Cr. 1 to 3 each time taken. Prereq 10 credits in biological sciences, permission of instructor.

A. Plant Pathology
B. Seed Science
C. Weed Science


Courses for Graduate Students, major or minor


698. Seminar. Cr. 1 F, S. A. Plant Pathology
B. Seed Science
C. Weed Science


A. Plant Pathology
B. Seed Science
C. Weed Science

Political Science

Victor A. Olortonsola, Chair of Department

Associate Professors: Boles, Dorfman, Hadwiger, Khi, Olortonsola, Parks, Rasmussen, Talbot, Wiggins

Instructor: Cotes

Undergraduate Study

For the undergraduate curriculum in sciences and humanities, with major in political science, leading to the degree of Bachelor of Arts, see Sciences and Humanities, Curriculum.

The study of political science is designed to enable students to become familiar with the theories of public values and patterns of political systems -- national, regional, and international. A political science major should complete a broad liberal arts program, which would maximize opportunities for study in related social science disciplines, as well as in various areas of the humanities.

Each student majoring in political science will work out with an advisor appropriate means for beginning to develop a facility in the use of a research tool. As a minimum, each student should have eight semester credits in a research tool, such as a single foreign language or quantitative techniques.

Students majoring in political science may substitute a second major in international studies in place of an optional minor in the College of Sciences and Humanities. See International Studies.

A political science minor has also been used by many students with majors in other disciplines. The availability of the minor is noted because so many occupations and activities are affected by politics and governmental activity. For information on a minor in political science, contact the department office.

A prelaw undergraduate program of study is offered and can be pursued through a major in political science. A more complete statement is available in the department office. See also Preprofessional Study.

A detailed statement of departmental requirements may be obtained from the departmental office.

Graduate Study

The department offers work for the degree Master of Arts with major in political science and minor work to students majoring in other departments.

The program is designed to enable its graduates to engage in government research, enter public service or private industry, pursue further graduate study, or teach. Both thesis and nonthesis options are available. Within either option, a specialization in public administration is possible. This department also has a joint Juris Doctor/Master of Arts Program with the Law School of Drake University.

In addition, graduate students may wish to work for certification in high school or junior college teaching.

The department also offers a Master of Public Administration. This is a professional degree in public administration. It is designed to provide interested students with the training necessary to operate within a public bureaucracy and organization. The M.P.A. degree requires 39 semester credit hours.

Brochures setting forth the detailed requirements for the degrees within each option, for the M.A./J.D. degree, and the M.P.A. degree may be obtained from the political science office.

A usual prerequisite for major graduate work in the department is the completion of at least 15 semester credits in political science. The Graduate Record Examination (for both aptitude and advanced examinations) is strongly recommended.

Each student entering the Master of Arts program in political science is expected to have completed one year of a foreign language (equivalent to eight semester credits) and a course in basic statistics (equivalent to Stat 101). If this has not been done, the student may remedy the deficiency by passing equivalent courses, for which no graduate credit will be received.

In addition, each student must complete one of the following requirements:

1. Language -- Two years of undergraduate instruction (including the one year of foreign language provided above) in a single language, with grades averaging 2.7 (on a 4.0 scale), or, a passing grade in the Educational Testing Service examination.

2. Statistics -- Successful completion of Stat 401. Stat 402 is recommended, but not required.
Courses Primarily for Undergraduate Students

215 American Government: Institutions and Politics. (3-0) Cr. 3 F

230 Introduction to Political Philosophy. (4-0) Cr. 4 F
Socrates: Sophomore classification. Talbot General Review of the theories of the major Western political philosophers. Application of these theories to contemporary political problems. Prereq: Sophomore classification.

231 American Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

232 Contemporary Political Thought. (3-0) Cr. 3 F
An introduction to critical and interpretive political thought. Themes include nature and role of political thinking; political philosophy; the application of political philosophy to political science; and selected topics. Prereq: Sophomore classification.

241 Domestic Politics. (3-0) Cr. 3 F
Studying American government and politics in a changing world. Topics include the American political process, American foreign policy, and the role of the American government in the world. Prereq: Sophomore classification.

242 Global Politics. (3-0) Cr. 3 F
An introduction to the study of international relations. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

243 Public Policy. (3-0) Cr. 3 F
An introduction to the study of public policy. Topics include the policy process, policy analysis, and public policy issues. Prereq: Sophomore classification.

244 Comparative Politics. (3-0) Cr. 3 F
An introduction to the study of comparative politics. Topics include the nature and causes of political systems, political institutions, and political behavior. Prereq: Sophomore classification.

245 International Politics. (3-0) Cr. 3 F
An introduction to the study of international politics. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

246 Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

247 Contemporary Political Thought. (3-0) Cr. 3 F
An introduction to critical and interpretive political thought. Themes include nature and role of political thinking; political philosophy; the application of political philosophy to political science; and selected topics. Prereq: Sophomore classification.

248 International Politics. (3-0) Cr. 3 F
An introduction to the study of international politics. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

249 Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

250 Introduction to Political Philosophy. (4-0) Cr. 4 F
Socrates: Sophomore classification. Talbot General Review of the theories of the major Western political philosophers. Application of these theories to contemporary political problems. Prereq: Sophomore classification.

251 American Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

252 Contemporary Political Thought. (3-0) Cr. 3 F
An introduction to critical and interpretive political thought. Themes include nature and role of political thinking; political philosophy; the application of political philosophy to political science; and selected topics. Prereq: Sophomore classification.

253 Domestic Politics. (3-0) Cr. 3 F
Studying American government and politics in a changing world. Topics include the American political process, American foreign policy, and the role of the American government in the world. Prereq: Sophomore classification.

254 Global Politics. (3-0) Cr. 3 F
An introduction to the study of international relations. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

255 Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

256 Contemporary Political Thought. (3-0) Cr. 3 F
An introduction to critical and interpretive political thought. Themes include nature and role of political thinking; political philosophy; the application of political philosophy to political science; and selected topics. Prereq: Sophomore classification.

257 International Politics. (3-0) Cr. 3 F
An introduction to the study of international politics. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

258 Public Policy. (3-0) Cr. 3 F
An introduction to the study of public policy. Topics include the policy process, policy analysis, and public policy issues. Prereq: Sophomore classification.

259 Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

260 Introduction to Political Philosophy. (4-0) Cr. 4 F
Socrates: Sophomore classification. Talbot General Review of the theories of the major Western political philosophers. Application of these theories to contemporary political problems. Prereq: Sophomore classification.

261 American Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

262 Contemporary Political Thought. (3-0) Cr. 3 F
An introduction to critical and interpretive political thought. Themes include nature and role of political thinking; political philosophy; the application of political philosophy to political science; and selected topics. Prereq: Sophomore classification.

263 Domestic Politics. (3-0) Cr. 3 F
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An introduction to the study of international politics. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

268 Public Policy. (3-0) Cr. 3 F
An introduction to the study of public policy. Topics include the policy process, policy analysis, and public policy issues. Prereq: Sophomore classification.

269 Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

270 Introduction to Political Philosophy. (4-0) Cr. 4 F
Socrates: Sophomore classification. Talbot General Review of the theories of the major Western political philosophers. Application of these theories to contemporary political problems. Prereq: Sophomore classification.

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Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.

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277 International Politics. (3-0) Cr. 3 F
An introduction to the study of international politics. Topics include the international system, international law, international organization, and global issues such as terrorism, nuclear proliferation, and globalization. Prereq: Sophomore classification.

278 Public Policy. (3-0) Cr. 3 F
An introduction to the study of public policy. Topics include the policy process, policy analysis, and public policy issues. Prereq: Sophomore classification.

279 Political Behavior. (3-0) Cr. 3 F
Research on the American political system, ranging from political institutions to public opinion. Prereq: Sophomore classification.
Bachelor's Degree Programs

Human Medicine. Most medical schools recommend a preprofessional background composed of a good foundation in the natural sciences (chemistry, physics), mathematics, highly developed communication skills, and a rich background in the social sciences, arts, and humanities. To obtain this background at Iowa State University, students should elect four years of professional study leading to the bachelor's degree. Many medical schools admit a small number of exceptionally well-qualified students after 3 years of preprofessional study. In the 3-year degree program a student completes the third preprofessional year at Iowa State University and then transfers back to the University not more than 32 semester credits* from the professional program in partial fulfillment of the requirements for the bachelor's degree.

Law. Nearly all accredited law schools now require an applicant to present a bachelor's degree with an excellent grade average for entry to the study of law. The bachelor's program should provide the student with a high skill in creative thinking, comprehension and expression of ideas, and understanding of human institutions and values. In a limited number of schools it is possible to receive a degree from Iowa State following three years of study here and completion of suitable credits in law. It is also possible to combine a master's degree program with a degree in law. In either case, early planning is required.

Medical Technology. Usually working under the supervision of a physician in the medical laboratory of a hospital, industrial or pharmaceutical company, or in conjunction with a public health agency, the medical technologist performs clinical, microscopic, bacteriologic and other tests, types and cross matches blood, and, with specialization, may operate radioscopic and X-ray equipment. The length of the preprofessional program is a minimum of 3 years of college education, with emphasis on biology and chemistry, followed by one year of professional education at an accredited hospital school of medical technology. Students wishing to earn the bachelor's degree from Iowa State University may choose a 3-year or 4-year preprofessional program. In the 3-year degree program a student completes the third preprofessional year at Iowa State University and then transfers back to the university not more than 32 semester credits* from the professional program in partial fulfillment of the requirements for the bachelor's degree.

Physical Therapy. Physical therapists work under the direction of physicians in administering therapeutic agents such as massage and exercise, heat, baths, light, and electricity. Preprofessional education must include a minimum of 3 academic years of study, including strong backgrounds in the natural sciences, social sciences, and humanities. After completing the preprofessional program, students transfer to a school of physical therapy, which is responsible for granting professional certification. In accordance with preplanning by the student, the bachelor's degree may be awarded by the institution offering the professional program or the professional program. Students wishing to earn the bachelor's degree from Iowa State University may choose a 3-year or 4-year preprofessional program. In the 3-year degree program a student completes the third preprofessional year at Iowa State University, and then transfers back to the university not more than 32 semester credits* from the professional program in partial fulfillment of the requirements for the bachelor's degree.

Speech-Language Pathology and Audiology. The Department of Speech (Communication Disorders) offers a preprofessional program in speech-language pathology and audiology leading to a Bachelor of Science degree in speech. The field of study is concerned with the nonmedical diagnosis and remediation of communication disorders involving speech, language, and hearing problems. The American Speech-Language and Hearing Association serves as the national certifying organization for speech-language pathologists and audiologists, and requires the master's degree or its equivalent. The curriculum consists of basic course work in the various facets of speech-language development and pathology, and audiology, as well as course work in disciplines such as psychology, child development, learning disabilities, zoology, and linguistics that provide a broad academic undergraduate background.

Theology. All theological schools require a bachelor's degree for admission. The American Association of Theological Schools recommends the following areas of study as the best preparation for theological studies: English language and literature, history, literature of non-Western cultures, philosophy, natural sciences, social sciences, especially psychology, sociology, and anthropology, the fine arts, Biblical and modern languages, religion, both Western and Eastern. Although students in a variety of major fields may qualify for admission to a theological school, interested students are advised to consult with a professional program with a representative of the Department of Philosophy or the Religious Studies Program.

Programs With Bachelor's Degree Optional

Cytotechnology. A cytotechnologist usually works under the supervision of a pathologist. Physicians and medical technologists in a medical laboratory. Duties involve processing, staining, mounting, and evaluating cells from the human body to determine cellular variations and abnormalities that should be called to the supervisor's attention. The length of the program is a minimum of 2 years of college education, with emphasis on the sciences, followed by 12 months of professional study. Students wishing to earn the bachelor's degree from Iowa State University may choose a 3-year or 4-year preprofessional program. In the 3-year degree program a student completes the third preprofessional year at Iowa State University, and then transfers back to the university not more than 32 semester credits* from the professional program in partial fulfillment of the requirements for the bachelor's degree.

Dentistry. Although some dental schools accept a minimum of 2 years of college education as a requirement for admittance, most have more extensive preprofessional requirements oriented toward a liberal arts education. Students are advised, therefore, to take at least 3 years of preprofessional college work. Students wishing to earn the bachelor's degree from Iowa State University may choose a 3-year or 4-year preprofessional program. In the 3-year degree program a student completes the third preprofessional year at Iowa State University, and then transfers back to the university not more than 32 semester credits* from the professional program in partial fulfillment of the requirements for the bachelor's degree.

Optometry. The optometrist detects and corrects abnormal vision without use of drugs or surgery, prescribed glasses, and judicious use of evidence of eye diseases requiring referral to other health care practitioners. The length of the preprofessional program is a minimum of 2 years of college education (which includes courses in biology, communications, physical sciences, social sciences, and the humanities) followed by 4 years of professional education. This leads to the awarding of a professional degree by the institution offering the professional program. Students wishing to earn the bachelor's degree from Iowa State University may choose a 3-year or 4-year preprofessional program. In the 3-year degree program a student completes the third preprofessional year at Iowa State University, and then transfers back to the university not more than 32 semester credits* from the professional program in partial fulfillment of the requirements for the bachelor's degree.

Veterinary Medicine. Preveterinary medicine students may enroll in either the College of Agriculture or the College of Sciences and Humanities. Many colleges of veterinary medicine require 3 years of preprofessional college education as a prerequisite to their professional program. This permits students to gain a broader educational background while completing their preprofessional medicine requirements. In the College of Sciences and Humanities, with careful planning, the student may earn a bachelor's degree upon completion of the first year of study in a college of veterinary medicine. For additional information see Veterinary Medicine, Admission Requirements.

Programs Not Leading to the Bachelor's Degree from ISU

Dental Hygiene. The dental hygienist provides a variety of patient treatments and services prescribed by the dentist. The preprofessional program consists of 3 years of liberal arts, after which the student transfers to another institution which offers the professional program. Satisfactory completion of this two-year program leads to the bachelor's degree from the professional institution.
Nursing. The registered nurse plans, gives, and evaluates nursing care and may direct others in giving this care. Iowa State University offers two years of preprofessional study, following which the student transfers to some other institution to seek the bachelor's degree and certification as a registered nurse. Students who plan to transfer during their sophomore year (first semester, or second semester) must file physical must earn additional physics 1 credits 1n their professional program. Students who are permitted fewer credits in their professional program of study committee. Four workshops of 4 semester credits 1n their professional program are required to take a seminar and complete 24 semester credits. Students may adjust the time of their off-campus teaching sites. Specific courses offered in the program and the location of the off-campus teaching sites may be obtained from the departmental course listings and by contacting the supervisory committee.

As mentioned above, a minimum of four credits of creative component experience is required. A thesis option is not available. The creative component is a demonstration of independent creativity with a written report of laboratory, field, or library research acceptable to the student's program of study committee. Four workshops of one credit each are also required. The workshop in applied statistics is mandatory. Two of the workshops must be taken on campus.

Pharmacy. The pharmacist prepares and compounds medicines from prescriptions of physicians and, in some employment situations, may test and inspect pharmaceutical products. To meet requirements of the professional program, students should take two years of preprofessional education. If only one preprofessional year is elected, the student will need to take biology or physics in the first professional year offered in a college of pharmacy to which the student is admitted. Successful completion of the 4-year professional program leads to the degree of Bachelor of Science in Pharmacy, granted by the professional institution.

*Students who are permitted fewer than 32 semester credits 1n academic work in their professional program must earn additional preprofessional credits to compensate for the difference.

### Professional Studies in Education

**J. Stanley Ahmann, Chair of Department**

Professors: Ahmann, Beavers, Boyles, Canute, Dils, Engel, Gowan, Hoh, Hopper, Howe, Hunter, Jones, Kegel, Lagonomarcino, Lawrence, Manatt, Netusil, Pellegrino, Reschly, Smith, Thomas, Warren

Emeritus Professors: Bryan, Holmes

Associate Professors: Dalton, Ebers, Hart, Huba, Jarchow, Miller, Ratcliffe, Theilen, Wilson

Assistant Professors: Litrell, Sweeney

**Graduate Study**

Professional studies offer work for the degrees Master of Science, Master of Education, and Doctor of Philosophy with major in education and minor work to students taking major work in other departments. Within the education major, a student may specialize in adult and extension education, educational administration, counselor education, higher education, historical, philosophical, and comparative studies in education, research and evaluation, curriculum and instructional media. The master's degree is the highest degree awarded in the elementary education and learning disabilities areas of specialization.

Prerequisite to major graduate work in education is preparation substantially equivalent to the completion of one of the undergraduate curricula in education offered at Iowa State University, or graduate preparation in a discipline to be used as a teaching field in a community college or university, and adequate proof that the student ranks above average in scholastic ability and promise of professional competence.

The foreign language requirement, if any, for the Ph.D. degree will be determined by the student's program of study committee. If no foreign language is required, the total program must consist of a minimum of 78 semester hours, at least 16 of which must be earned outside the area of specialization. Research tools such as statistics and research methods may not be included in the 16 hours. Should foreign language be included, the program of study committee may adjust the minimum program requirement downward but in no instance may the required credit be less than 72 semester hours. Students whose native language is not English may substitute competence in English.

Other graduate programs related to education (including General Graduate Study) may be planned for students on the basis of previous education and experience as well as future plans and needs. Students should refer to Agricultural Education, Home Economics Education, Industrial Education, Physical Education, and General Graduate Studies or to graduate-level course offerings within other departments.

Open to graduate students for minor credit only.

### Ad Ed 469

**Adult and Extension Education (Ad Ed)**

John P. Wilson, Acting Section Leader

**Course for minor graduate credit only**

469 Introduction to Adult and Extension Education (3-0) Cr 3 F Prereq 9 credits in education or related areas. An overview of adult and extension education its development, organizations, objectives, programs, and procedures. Development of prospective extension agents and other adult educators.

### Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

536. Foundations of Adult Education (3-0) Cr 3 F Prereq 469. A study of the modern practice of adult education from the perspective of its history, philosophy, and literature.

537. Teaching in Adult Education (4-0) Cr 4 S SS Prereq 469 or 536. Instruction and learning, theory, methods and techniques. Development of approaches for teaching adults.

538. Community and Adult Education (3-0) Cr 3 S Prereq 536. Preparation for adult educators in the development of community based education programs. Community education concepts, community needs, resources, leadership and services.

539. Program Development in Adult and Extension Education (3-0) Cr 3 F SS Prereq 536. Principles, models and evaluation of program planning processes.

590. Special Topics. Cr 1 to 6. Prereq 9 credits in adult and extension education.

591. Practicum/Internship. Cr 1 to 6. Prereq 9 credits in adult and extension education. Practicum or internship designed for work experience in adult and extension education. Examples include continuing education centers, community colleges extension offices, training divisions, etc.

593. Workshop. Cr 1 to 3. Prereq 536. Workshops designed to provide intensive, concentrated, and experience-oriented exposure to a special adult and extension education topic.

595. Colloquium in Adult and Extension Education. Cr 1 to 3. Prereq 6 credits in education. Offered when demand warrants.

### Adult and Extension Education (Ad Ed)

601. Theory Building in Adult Education. (3-0) Cr 3 F Prereq 536, 537, 538, 539. Examination of what is theory and developing theory in adult education.

615. Seminar (1-0) Cr 1-3 F SS Prereq 10 credits in adult and extension education. Permission of instructor. Group study and discussion on student and staff research in adult and extension education.

699. Research. Cr arr F SS Prereq 10 credits in adult and extension education, permission of instructor.

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**Preprofessional Study/Professional Studies in Education**

Donald G. Woolley, Chairman, Supervisory Committee

Supervisory Committee: C. E. Anderson, M. D. Bohle, R. L. Willham

The major in professional agriculture is an off-campus program leading to the degree Master of Agriculture. It is available to students who wish to pursue graduate study in agriculture without taking formal course work on campus. The program is considered to be a terminal masters degree. Those who major in professional agriculture are required to take a minimum of two courses in each of three disciplines and complete 24 semester credits of formal course work, as well as 4 semester credits for a creative component, and 4 semester credits of workshops. Courses are offered in agricultural mechanization, agronomy, animal science, and economics. Specific courses offered in the program and the location of the off-campus teaching sites may be obtained from the departmental course listings and by contacting the supervisory committee.

As mentioned above, a minimum of four credits of creative component experience is required. A thesis option is not available. The creative component is a demonstration of independent creativity with a written report of laboratory, field, or library research acceptable to the student's program of study committee. Four workshops of one credit each are also required. The workshop in applied statistics is mandatory. Two of the workshops must be taken on campus.
Counselor Education (Co Ed)

Gordon Hopper, Section Leader

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

530 Human Interaction and Learning. (3-0) Cr. 3 F S S. Prereq: Co Ed 530. Proactive involvement in defining, delivering, scheduling, and evaluating guidance services in a school setting. Leadership styles, basic relations, and identifying and working within the school and community power structure in relation to establishing and redefining guidance service objectives. Methods of evaluating the impact of services. (3-0) Cr. 3 At S S, offered 1982. Prereq. Co Ed 530. Bases of self, others, and institutions with strategies for change.


560 Theories of Counseling. (2-0) Cr. 2 F S S. Prereq: Co Ed 560. Current approaches to counseling for facilitation of choice and/or behavioral change.

561 Counseling Techniques: Adolescent and Young Adult. (2-1) Cr. 2 F S S. Prereq: Concurrent enrollment in Co Ed 560 and a minimum of 6 semester hours of counseling through exposure to didactic and laboratory work with clients. The laboratory portion stresses skill building in listening and responding, identifying barriers to change and planning.

565 Counseling Techniques: Preadolescents. (2-0) Cr. 2 F Peir. Credit or classification, Co Ed 565. Applied use of role playing, fantasy, classroom groups, relaxation, and other specific techniques that can be utilized as a means of influencing the preadolescent with self-understanding, problem solving and other developmental concerns.

570 Theories of Group Procedures. (2-0) Cr. 2 S S S. Prereq: Co Ed 560. Current group counseling approaches for facilitation of choice and/or behavioral change.

571 Laboratory Experience in a Counseling Group. (2-0) Cr. 1 F Peir. Prereq Co Ed 570. Enrolled students will be permitted to participate in a group counseling setting. Offered on a satisfactorily-basis only.

580 Practicum in Counseling. (2-0) Cr. 4 F S S. Prereq Co Ed 561 or 565. Designed for students who desire counseling experience in a nonschool setting. Practicum experience can be arranged at youth centers, detention facilities, MOTA centers, vocational rehabilitation centers, etc.

581 Practicum in Secondary School Counseling. (2-0) Cr. 1 F Peir Co Ed 561. Placement in a secondary school for junior high school. The practicum student will perform various role functions expected of the school counselor. Emphasis on individual and group counseling functions.

582. Practicum in Elementary School Counseling. (2-0) Cr. 4 F Peir Co Ed 565. Placement in an elementary school. Counseling students, consulting with teachers and parents and coordinating activities that enhance and growth both in the cognitive and affective domains.

590. Special Topics. Prereq: 10 graduate hours in counselor education
A. Creative Component. Cr. 1-2
B. Independent Study. Cr. 1-2

593. Workshop in Counseling and Guidance. (3-0) Cr. 2 S S. Prereq. 10 hours in counselor education. Workshops are designed to give practicing school counselors an in-depth exposure to a counseling model with concurrent opportunity for application of the model conducting discussion, questioning and reinforcement are included, as well as simple media production and classroom testing and evaluation.

512. Strategies for Classroom Teaching. (2-3) Cr. 3 F S S. Prereq. Graduate standing. Voting theoretical and practical experience in the design, production, presentation, and evaluation of a body of knowledge in a specific content area. Behavioral objectives, production of media, microteaching, and methods for handling large group, small group, and individualized instruction.

542. The Secondary School Curriculum. (2-0) Cr. 2 F S S. Prereq. Teacher certification, Dills, Glass, McNaify-Jarchow. Curricular and co-curricular programs of secondary school in content, goals, content organization, and organization for instruction, local community resources as curriculum content.

545. The Elementary School Curriculum. (2-0) Cr. 2 F S S. Prereq. Teacher certification, Dills, Glass, McNaify-Jarchow.Curricular and co-curricular programs of elementary schools, recent trends in goals, content organization, and organization for instruction, local community resources as curriculum content.

590. Special Topics. Cr. 1-3 Prereq. 9 credits of graduate work in education
A. Curriculum
B. Instructional Media
C. Science Education
D. Secondary Education

591. Supervised Field Experience. Cr. 1-3 Prereq. 9 credits of graduate work in education. Supervised on-the-job field experience in special areas.

593. Workshops. Cr. 1-3 Prereq. 9 credits of graduate work in education
A. Curriculum
B. Instructional Media
C. Science Education
D. Secondary Education


596. Problems of Curriculum. (3-0) Cr. 3 S At S S, offered 1982. Prereq. 6 credits of graduate work in education, Dills, Glass, McNaify-Jarchow. Analysis of curriculum theories and principles of curriculum construction and evaluation, models in the areas of assessment, development, implementation, sociocultural factors affecting the curriculum.

Courses for Graduate Students, major or minor

501. Principles and Practices of Educational Media. (3-0) Cr. 3 S S. Prereq Graduate classification, Volker, Smerson. Organization of educational media centers in school and industrial settings. Analysis of types of hardware and software distribution, organization, produce, and evaluate information with media. Application of research findings relative to media and learning; preparation of a variety of teaching materials.

502. Producing Visual Media. Cr. 2-4 S S. Prereq Curr 501. Volker. Production of sequential visual materials, planning and design of visual instructional media as applied to still photography, film production, vide production, or instructional graphics. Laboratory work in production of visual media, methods of research on the design, production and utilization.


504. Managing and Evaluating Media Programs. (3-0) Cr. 3 S S. Prereq. Curr. 501 Volker, Smerson. Survey of the organization and procedures for managing and producing a program in an education setting. Methods for gathering data, developing and evaluating job descriptions, and analyzing budget, personnel and production procedures, and physical facilities. Development of in-service and public relations programs for selected media centers.

511 Teaching Assistant’s Orientation Seminar. (1-1) Cr. 1 F S S. Prereq. Survey of basic techniques of college teaching for graduate teaching assistants who have no background in teaching. Videotaped multimedia experiences emphasizing methods of lecturing. Analyses of the nature and function of units of education at local, intermediate, and state levels. Exploration of substantive aspects as school leaders. Analysis of administrative skills and individual assessment of those skills.

Educational Administration (Ed Adm)

Richard Manatt, Section Leader

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates


183
543. The Administration of School Personnel I (3-0) Cr 3 All SS Prereq: 593  Creeds in education. Critical evaluation of the major research in systems analysis, operations research, and prediction models as they apply to the management of schools and colleges, staff development techniques and theories, models and cases of organization development
599 Research Cr ar: Prereq 9 credits in education

Higher Education (Hg Ed)
James Ratcliff, Section Leader

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

544. Planning Facilities for Higher Education (2-0) Cr 2 S Prereq Graduate standing includes the feasibility study, planning team and planning process, site selection, specifications, schematic design, contract documents and bidding, construction, remodeling, and energy conservation.

560. Higher Education in the United States (3-0) Cr 3 F SS Prereq Graduate standing Historical development, diversity, functions, and problems of institutions, federal programs, basic and applied research, and growing graduate education, philosophies, trends, and issues. A prerequisite for other courses in higher education.

561. Methods of College Teaching (2-0) Cr 2 S Prereq 6 graduate credits in educational theory and methods relating to college teaching. Require abilities and responsibilities of the contemporary college teacher.

562. Curriculum and Instruction in Higher Education (3-0) Cr 3 S Prereq 560 Models of curriculum design, written educational objectives, liberal, general, career, and professional education, improvement of instruction, non-traditional education.

563. College Personnel Policies and Practices (3-0) Cr 3 F S S Prereq 562 The purposes of personnel policies and practices, in-service development, salaries and fringe benefits, promotions, tenure, retirement, and recruitment. Faculty organizations and collective bargaining.

564. The Comprehensive Community College (3-0) Cr 3 All SS Prereq Graduate standing. The community college as a unique institution: its historical development, goals and purposes, organization, programs, and specific characteristics.

565. Student Personnel Services in Higher Education (3-0) Cr 3 F Prereq Credit or classification in 563 An integrated approach to student personnel work with consideration of student activities, counseling services, financial aids, admissions, student conduct, and residential programs, includes college community programs.

566. Organization and Administration of Student Personnel Services (2-0) Cr 2 S Prereq 564 Organization structures, role and function of student personnel staff, policies and decision-making for student personnel services.

576. Student Development in Higher Education (2-0) Cr 2 S Prereq 574 The student development approach to student personnel work. Theories of student development and their applications, student personnel management, problems, and the student's role in the decision-making process. Academic programs, and moral development will be discussed.

590 Special Topics, Cr 1 to 4 Prereq 9 credits in education.

Courses for Graduate Students, major or minor

615. Seminar (1-3) Cr 1 to 3

641. Administrative problems (3-0) Cr 3 S Prereq 541, 544, 545 Engaging in activities of collective bargaining in the public sector. Selected topics such as affirmative action, legal aspects of personnel administration, evaluation of administration, and staff welfare.

644. Educational Finance (3-0) Cr 3 S Prereq 541, 544, 545, 546. Financial aspects of collective bargaining in the public sector. Selected topics such as affirmative action, legal aspects of personnel administration, evaluation of administration, and staff welfare.

678. Administrative Theory in Education (3-0) Cr 3 F Prereq: Master's degree, permission of instructor. Manpower. Historical background of current thinking in administration and organization, theoretical approaches to administration: analysis of functions and processes of administration as they apply to education.

689. College Organization and Management (3-0) Cr 3 S Prereq: 560 Administrative organization and behavior, communications, leadership, distribution of power, institutional governance. Financial administration, including fund-raising, management of sponsored research and special projects.

Historical, Philosophical, and Comparative Studies in Education (HPC Ed)
George Kizer, Section Leader

Courses Primarily for Graduate Students, major or minor, or open to qualified undergraduates


586. Comparative Education — Non-European (3-0) Cr 3 All SS, offered 1982 Pre req 585. Smith. Conflict in the role of education in development educational systems, practices, and issues in selected non-European countries — e.g., China, Japan, India, the Philippines, efforts at institutional educational assessment.


600 Special Topics, Cr 1 to 5 Pre req 9 credits in education.

Counselling for Graduate Students, major or minor


615. Seminar (1-3) Cr 1 to 3 A History of Education B Philosophy of Education C Comparative Education

599 Research Cr ar: Prereq 9 credits in education
Research and Evaluation (Res Ev)
Anton Nettell, Section Leader

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

550 Basic Educational Research with Statistical Application (3-0) Cr. 3 F S SS Prereq 9 credits in education, introduction to educational research methodology. Application of fundamental statistical concepts and basic procedures for analyzing educational data. Designed primarily for educators doing non-thesis work.

552 Beginning Educational Statistics and Research. (3-1) Cr. 3 F S SS Prereq 9 credits in education, and 550 or 3 credits in mathematics. Statistical concepts and procedures for analyzing educational data. Introduction to educational research design and descriptive statistics with educational computer applications.

553 Intermediate Educational Statistics. (3-1) Cr. 3 S SS Prereq 552 A continuation of statistical concepts and procedures for analyzing educational data. Introduction to inferential techniques with educational computer applications.

557 Computer Applications in Education. (3-0) Cr. 3 F S SS Prereq 550 or 552 Use of computers in processing educational research data including experiences utilizing statistical packages such as SPSS and a general purpose language such as PL/1. Data coding; data representation and conversion; files; computer organization, and job control language.

558 Principles of Evaluation. (2-0) Cr. 2 F S SS Prereq 557, 558 or 550. Review of the development and statistical analysis of appropriate evaluation procedures and evaluation models. Discussion of relevant topics such as norm vs criterion referencing, domain referenced tests, competency testing, grading practices, etc.

561 Program Evaluation. (2-0) Cr. 2 F S SS Prereq 557, 558 Techniques of conducting an evaluation of instructional programs. A variety of evaluative models will be explored and the student will apply at least one such model to an on-going program.

590 Special Topics Cr. 1-3 each taken. F S SS Prereq Permission of instructor. Guided reading and/or study on special topics. Two hours normally given for one credit. Course of study selected to fill educational or career needs in the student's major program.

592 Workshop Cr. 1-3 each taken. Offered when demand warrants. Prereq Permission of instructor. Intensive, concentrated exposure to a special educational research or evaluation problem.

Courses for Graduate Students, major or minor

615 Seminar (1-0) Cr. 1 Prereq 3 credits in research and evaluation, permission of instructor. Group study and discussion on a wide variety of topics in research and evaluation.

654 Advanced Educational Research and Design. (3-0) Cr. 3 F S SS Prereq 553 Advanced research methodology and design of research. Problems in selection, design, measurement, statistical analysis, and interpretation of data. Applicable for thesis or dissertation research.

699 Research Arranged F S SS Prereq Permission of instructor.

Psychology

David C. Edwards, Chair of Department


Professors Emeritus: Fritz

Associate Professors: Andre, Hughes, Krulwitz, Lando, Mason, Phye, Scott

Assistant Professors: Epperson, Gibbons, Gresham

Instructor: Hinz

Undergraduate Study

For the undergraduate curriculum in sciences and humanities, with major in psychology, leading to the degree Bachelor of Science, see Sciences and Humanities, Curriculum.

Psychologists are concerned with behavioral research, teaching, and applications of research in a variety of settings.

An undergraduate major in psychology may be taken as general education or as preparation for graduate study. Undergraduate psychology majors who have concurrent majors with other departments such as sociology, business administration, or family environment may qualify for certain positions in industrial-personnel and social welfare systems as well as for professional work in correctional, rehabilitation, and retardation centers. Such diversified education must be planned early in the undergraduate career and in close consultation with an adviser. Professional work in psychology requires graduate degrees.

A program of study that meets the needs and interests of the student and the department will be developed in consultation with the adviser. Departmental requirements for all students and suggested courses for students with certain specified goals are set forth in a brochure available from advisers.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with major in psychology, and minor work to students taking major work in other departments. A two-year Specialist degree program is offered in school psychology.

Students desiring a graduate major in psychology must have been graduated from an accredited college in a curriculum substantially equivalent to the undergraduate curriculum in sciences and humanities at Iowa State University. Prerequisite to admission is at least 15 credits of basic psychology, which should include a laboratory course and a measurement-statistics course.

The department also participates in the interdepartmental program of Industrial Relations (see index).

A formal class and a supervised practicum in the teaching of psychology is required of all doctoral degree candidates and strongly recommended for master's level students whose future plans may include teaching at the college level.

Open to graduate students for minor credit only

311L. 401, 422, 425, 430, 431, 434, 436, 440, 450, 461, 460

Courses Primarily for Undergraduate Students

101 General Psychology. (3-0) Cr. 3 F S SS. Introduction to fundamental psychological concepts derived from the application of scientific method to the study of behavior. Applications of psychology 101H: F Honors section. (For students in the University honors program only)

131 Academic Learning Skills. (2-0) Cr 1 F S SS. Efficient methods of study and reading. Offered on a satisfaction-fail basis only.

230 Developmental Psychology. (3-0) Cr. 3 F S SS. Characteristic development and decline of physical traits, learning and intelligence, social and emotional behavior, personality and adjustment from conception to senescence. Emphasis on childhood and adolescence. 230H: S Honors section. (For students in University honors program only)

250 Consumer Psychology. (3-0) Cr 3 F S SS. Theory and application of psychological principles to consumer behavior, including marketing, decision-making, sales promotion, various factors influencing buying, the purchase process, and consumerism. Introduction to consumer surveys and motivation research.

280 Social Psychology. (3-0) Cr 3 F S SS. Prereq 101 Individual human behavior in social contexts. Emphasis on attitudes, perception of others, social influence, attraction, aggression, and small group behavior. Such as conformity, persuasion, leadership, and group dynamics.

301 Research Design and Methodology. (3-0) Cr. 3 F S SS Prereq Stat 101. 2 courses in psychology. Rationale underlying procedures for control and manipulation of experimental variables in psychology. Research designs appropriate for various research questions. Laboratory experience in designing research, collecting and evaluating data, and preparing research reports.

311L Brain and Behavior. (3-0) Cr 3 F S SS Prereq 101, Biol 109 or 110 or Zool 155 Survey of basic concepts in the neurosciences with emphasis on brain mechanisms mediating sensory processes, arousal, motivation, learning, and abnormal behavior.

311L Laboratory Brain and Behavior. (0-4) Cr. 2 S Prereq Credit or classification in 311 Techniques of stereotaxic surgery on the rat, lesions, electrical and chemical stimulation of the brain, Behavior analysis and histological evaluation of brain manipulations.

312 Perception — Information Processing. (3-0) Cr. 3 F S SS Prereq 101 Functioning of the human perceptual systems as the brain processes information through those systems. Emphasis on vision and audition.

313 Learning. (3-0) Cr 3 F S SS Prereq 101 Fundamental concepts and principles of learning. Consideration of data from human and animal experimentation.

314 Motivation. (3-0) Cr 3 F S SS Prereq 101 Concepts and topics of motivation including curiosity, arousal, emotion, sex, aggression, drive, instinct, sleep, fatigue, and hunger.

315 Drugs and Behavior. (3-0) Cr 3 S Prereq 101, Biol 109 or 110 or Zool 155 Fundamentals of psychoactive drugs and their use in experimental, therapeutic, and social contexts.

316 Cognitive Processes. (3-0) Cr 3 F S Prereq 101 How humans process and use information in thinking, problem solving, and using language. Fundamental processes in perceiving, coding, storing, and retrieving information from short and long term memory.

333 Educational Psychology. (3-1) Cr. 3 F S SS Prereq 230 or C.D. 226 Human learning with particular reference to applications in educational settings, intellectual, personal, and social influences on the learning process; measurement and evaluation of educational outcomes.

348 Psychology of Women. (WS 348) (3-0) Cr. 3 S Prereq 2 courses in psychology including 101 Survey of psychological literature relating to biological, developmental, interpersonal, and societal determinants of the behavior of women.
350. Human Factors. (3-0) Cr. 3 F Prereq 101 Survey of human factors, interaction of people with machines, or environmental psychology. System performance, human errors, interface requirements, research needs, personnel requirements, accident prevention, environmental concerns of household and workplace

360. Psychology of Normal Personality. (3-0) Cr. 3 F S SS Prereq 101. Theories and research in the study of development and functioning of normal personality

381. Social Psychology of Small Group Behavior. (Soc 381) (3-0) Cr 3 S S Prereq 280 or Soc 305. A survey of small group research and theory from a social psychological perspective. Major theories of interpersonal behavior such as exchange theory, equity theory, and status consistency theory, and major areas of research such as leadership, power, conformity, bargaining, status, norms, and roles

382. Environmental Psychology. (3-0) Cr 3 F Prereq 101 Survey of current psychological research and theory on the effects of the environment on human behavior. The general social and physical environment will be considered as they relate to mood, prosocial and antisocial behavior, stress, and interpersonal relations

401. History of Psychology. (3-0) Cr 3 S S Prereq 4 courses in psychology. American psychology development including its philosophical origins, schools of thought, and modern theoretical viewpoints

413. Psychology of Language. (3-0) Cr 3 Alt S offered 1982 Prereq 101, and Engl 219 or Anth 221. Psychological processes involved in primary linguistic activities (speaking and listening) and secondary linguistic activities (writing and reading)

422. Counseling Theories and Techniques. (2-2) Cr. 3 F S Prereq. 3 courses in psychology including 460. Survey, consideration of counseling and supervised practice in the specific skills and techniques employed

425. Principles and Methods of Interviewing. (2-2) Cr 3 F Prereq 101. Psychological processes involved in primary linguistic activities (speaking and listening) and secondary linguistic activities (writing and reading)

430. Psychology of Adolescence. (3-0) Cr 3 F S SS Prereq 2 courses in psychology including 230 Developmental characteristics of the adolescent, examination of antecedents of behavior with a goal of better understanding of this age group, implications for education and guidance

431. Psychology of Maturity and Old Age. (3-0) Cr 3 F Prereq 3 courses in psychology including 200 Physiologically important structural and functional changes in the human from maturity to old age. Typical as well as individual unique psychomotor, cognitive and somatic characteristics and declines

434. Principles of Behavior Modification. (3-0) Cr 3 S S Prereq 313 or 333 Basic principles and applications of behavior modification procedures with emphasis on applied settings such as classrooms, institutions, and families. Consideration of appropriate uses and ethical concerns

436. Psychology of the Exceptional Individual. (3-0) Cr 3 F S SS Prereq 230, 333, 440. Behavioral characteristics of the mentally retarded including theoretical views and research on etiology, prevalence, learning, adjustment, clinical practices, and educational programs. Emphasis on current issues such as recent litigation, bias in assessment, labeling effects and assessment of adaptive behavior


450. Industrial Psychology. (3-0) Cr. 3 F S Prereq 2 courses in psychology including 101 Content and methods of industrial psychology. Selection and placement, morale appraisal, framing, testing in industry, techniques of interviewing, human error, accidents, and job analysis

451. Organizational Psychology. (3-0) Cr 3 F S Prereq 2 courses in psychology including 101. Content and methods of organizational psychology. Emphasis on organizational theory, structure of organizations, motivation, leadership, job satisfaction, communication, problem solving and action

460. Abnormal Psychology. (3-0) Cr 3 F S SS Prereq 3 courses in psychology including 101 Description of major forms of maladaptation including neuroses and psychoses. Factors in the development of behavior deviation. Development, development, and maintenance of abnormal behavior

490. Independent Study. Var F S SS Prereq Permission of instructor, minor classification

A. Supervised Reading
B. Supervised Research Prereq 301
C. Fieldwork of Practical
D. Seminar
H. Honors

Course Primarily for Graduate Students, major or minor, open to qualified undergraduates

508. Research Methods in Applied Psychology. (3-0) Cr. 3 Alt S offered 1983 Prereq 440, Stat 402. Research methods in natural and controlled environments, cross-sectional and longitudinal studies, observational and experimental approaches, experimental and quasi-experimental designs, single subject research procedures, time series designs, studies of intact groups, evaluation, person-situation interactions, meta-analytic research procedures

511. Advanced Physiological Psychology. (3-0) Cr. 3 Alt F offered 1981 Prereq 311 Neurophysiological concepts of behavior, thinking, and conceptual behavior

512. Advanced Perception. (3-0) Cr. 3 Alt S offered 1982 Prereq 312 Historical and modern information processing approaches to theory and research in vision and audition

513. Advanced Animal Learning. (3-0) Cr. 3 Alt F offered 1982 Prereq 313 Examination of empirical and theoretical issues of classical and instrumental conditioning

514. Advanced Human Learning, Memory, and Cognition. (3-0) Cr 3 Alt F offered 1982 Prereq 316 Historical and contemporary survey of human subjective behavior, thinking, and conceptual behavior

517. Psychopharmacology. (3-0) Cr. 3 Alt F offered 1981 Prereq 517 Fundamentals of drug-behavior interactions with emphasis on psychoactive drugs and their use in experimental, therapeutic, and social settings

530. Life Span Developmental Psychology. (3-0) Cr. 3 S S Prereq. 4 courses in psychology, including 230. Psychological changes in human behavior from conception to senescence in physical, sensory, intellectual, emotional, and social development. Consideration of current longitudinal studies

533. Advanced Educational Psychology. (3-0) Cr. 3 F S S Prereq. 3 courses in psychology, including 333. Human learning and cognition with reference to application in educational settings. Emphasis on the effects of learner characteristics such as intellectual, personal, and social factors on the learning process. Consideration given to instructional theory and models

536. Mental Retardation. (3-0) Cr 3 S S SS Prereq. 436 Psychological characteristics of the mentally retarded including theoretical views and research on etiology, prevalence, learning, adjustment, clinical practices, and educational programs. Emphasis on current issues such as recent litigation, bias in assessment, labeling effects and assessment of adaptive behavior

537. Psychological Characteristics of Giftedness. (3-0) Cr. 3 Alt S offered 1982 Alt S offered 1983 Prereq 2 courses in psychology, including 230. Cognitive and affective development of giftedness throughout the life-span. Giftedness as a generic term includes the intellectually superior, the talented, and the creative. Emphasis on current theoretical views and research in cognition and problem solving, as well as social-emotional adjustment


542. Psychoeducational Assessment. (4-0) Cr. 4 F S S Prereq. 440 Theory and research concerning assessment of intelligence and achievement with emphasis on developmental patterns and diagnosis of learning problems. Critical examination of current assessment practices in clinical and educational settings

544. Practicum in Assessment. Prereq 542 and permission of instructor. Supervised practice in administering, scoring, interpreting, and reporting individual tests

A. WISC-R and Stanford-Binet (1-2) Cr 1 F
B. McCarthy and ITPA (1-2) Cr 1 S
C. WANS and Multiple Tests (1-2) Cr 1 F

550. Advanced Industrial Psychology. (3-0) Cr 3 F S Prereq. 440, Stat 402 Critical evaluation of current research, advanced methodologies, and professional problems in industrial psychology

551. Advanced Organizational Psychology. (3-0) Cr. 3 S S SS Prereq 509, Stat 402 Examination of occupational behavior research including motivation, job satisfaction, organizational climate, organizational effectiveness and productivity. Attention devoted to theoretical methodology and applied issues

550. Personality Psychology. (3-0) Cr 3 F S Prereq. 440 Critical review of theoretical perspectives and current research on the development and maintenance of the major forms of maladaptation including schizophrenia, anxiety, affective, drug use personality, psychosocial, reactive, and childhood disorders

552. Personality Assessment. (3-0) Cr 3 S Prereq 440, Stat 402 Principles, concepts, and methods of personality assessment. Though not a practicum course, exposure is given to a variety of objective, projective, and situational tests

558. Advanced Social Psychology I. Psychological Perspectives. (3-0) Cr 3 S Prereq 280, 440, Stat 402. Consideration of current research and theory in psychology, including 280. Current theories, methods and research in social psychology with an emphasis on individual processes such as attraction, attitude change, attitudes, attraction, and helping behavior

561. Advanced Social Psychology II. Psychological Perspectives. (3-0) Cr 3 Alt S offered 1982 Prereq 508 Current theories, methods, and research in social psychology with an emphasis on the individual within a social context. Focus on social interaction and interpersonal processes

590. Special Topics. Cr var F S S Prereq. 12 credits in psychology, permission of instructor. Directed reading on topical topics or individual research projects

A. Counseling
B. Industrial Organizational
C. School Psychology
D. Individual Differences
E. Experimental
F. Educational
G. Psychopathology
H. Abnormal
J. Engineering
K. Developmental
L. Exceptional Children
M. Consumer
N. Cultural
O. Personality
P. Psychometrics

Courses for Graduate Students, major or minor

601. Historical and Systematic Psychology. (3-0) Cr. 3 F Prereq. Second year graduate classification. Origins of psychology in philosophical, medical, and related thought. Development of psychology in the nineteen and twentieth centuries. Traditional and contemporary theoretical approaches to areas of experimental, academic, and applied psychology

610. Psychological Counseling. Introduction to Theory, Process, and Techniques. (3-0) Cr 4 F Prereq 4 courses in psychology including 440 and 460 Combined survey of theoretical issues and approaches with practical development of counseling skills and techniques. Didactic coverage of theoretical viewpoints at an introductory level. Laboratory based development of relationship skills and interview techniques using models and role-playing techniques

623. Vocational Behavior. (2-2) Cr 2 F Prereq 3 courses in psychology. Theories, research, and issues in career development and choice. Relationships to job satisfaction and performance, influences of sex roles, age, and institutional factors on career behavior

625. Group Counseling. (2-2) Cr 3 S Prereq 621 Survey of theoretical approaches, research, techniques issues, and ethics in group counseling. Concurrent participation in a group counseling experience
Religious Studies

Richard J. Van Ilen, Chair, Advisory Committee


Religious studies is a cross-disciplinary program in the College of Sciences and Humanities. It consists of a core of courses in religious studies and a number of related courses in various departments.

Religious studies gives students the opportunity to investigate and reflect on the religions of mankind in an objective, critical, and appreciative manner. Though there is emphasis in religious studies on the wide variety of religious phenomena as well as on the various methods in the study of religion, the aim is to help students develop their own integrated understanding of the nature of religion and its role in the life of mankind.

Undergraduate Studies

Undergraduate studies in religion, besides having their own intrinsic interest, prepare students for graduate work in theology or religion and teaching about religion in secondary education. They serve as supporting studies for graduate work in other humanities and social sciences.

The program provides students with the following opportunities to fulfill group requirements, to minor in religious studies, to major in philosophy with a concentration in religious studies, to use religious studies as a component of a distributed studies major, to take religious studies courses that are integrated into another major, to take one or more religious studies courses as electives.

Courses are offered in four essential areas of study: 1) historical and literature of Western religions, 2) history and literature of Eastern religions, 3) religious thought, 4) religion and culture.

In addition to the core courses described below, the following courses are an integral part of the religious studies program:

Art 280, 281 History of Art
Engr 356 The Bible as Literature
Hist 207 Introduction to East Asian Civilization
Phil 310 Ancient and Medieval Philosophy

In addition, such courses as the following may sometimes be relevant to a particular student's program of study: Engl 353, 354, 373, 473, 474, Gorer Finch 101, 102, 201, 202, Hist 201, 207, 401, 402, 403, 405, 406, 408, Phil 300, 312, 320

Graduate Study

The program offers courses for graduate minor work in religious studies as supporting work for other fields.

Courses open to graduate students for minor credit only: 321, 322, 350, 353, 365, 465, 475, 590

*Religious studies core faculty and student advisers

Courses Primarily for Undergraduate Students

200. Introduction to Religious Studies (3-0) Cr 3, or (3-1) Cr 4 F SS SS. A systematic presentation of the various areas of study in terms of both subject matter and methodology. Fundamental characteristics of religions such as rituals, beliefs, and institutions in relation to the experience and practice of religion in both its western and eastern forms.

210. Religion in America (3-0) Cr 3, or (3-1) Cr 4 F SS SS. Introductory study of the major beliefs, practices, and institutions of American Judaism, Catholicism, and Protestantism with attention given to denominations, civic religion, and new religious movements.

221. Introduction to the Bible (3-0) Cr 3, or (3-1) Cr 4 F SS SS. Modes of interpretation and methods of study. Basic themes creation and exodus, prophecy and messiah, sin and salvation. The Bible and contemporary religion, ethical and social issues.

240. Belief and Unbelief (3-0) Cr 3, or (3-1) Cr 4 F SS SS. Investigation of nineteenth- and twentieth-century critiques of religion, and religious thinkers who defend religion against its critics.

250. Introduction to World Religions (3-0) Cr 3, or (3-1) Cr 4 F SS SS. Survey of basic beliefs and practices of major contemporary religions of the world, such as Hinduism, Buddhism, Confucianism, Taoism, Shinto, Christianity, Judaism, and Islam, dealing with basic problems in understanding different types of religion. Some attention to problems of interpreting different religions.

301. The Old Testament (3-0) Cr 3, or (3-1) Cr 4 F SS SS. Literature and religion of ancient Judaism understood within the context of ancient Near Eastern cultures. Particular attention given to the development of basic religious and ethical perspectives and their modern relevance.

302. The New Testament (3-0) Cr 3, or (3-1) Cr 4 F SS SS. Pre-requisites: 100-level course in religious studies. Literature and religion of early Christianity and its context of contemporary Judaism and Hellenistic culture. Particular attention given to the development of basic religious and ethical perspectives and their modern relevance.

303. Science and Religion in Modern European Thought (Hst 323) See History

340. Anthropological Perspectives of Religion (Anthro 340) See Anthropology

350. Philosophy of Religion (Phil 350) See Philosophy

353. Ways of Enlightenment: Hinduism and Buddhism (3-0) Cr 3, or (3-1) Cr 4 F Pre-requisite: 100-level course in religious studies. The various Hindu and Buddhist paths to enlightenment and freedom. Special attention to meditation and yoga and their relationship to altered states of consciousness and Western methods of psychophysical integration.

365. Western Religious Thought (3-0) Cr 3, or (3-1) Cr 4 F Pre-requisite: 100-level course in religious studies. An examination of the religious and intellectual upheaval of the Reformation against its medieval background and its subsequent development. Focus on a critical and sympathetic understanding of the major theological, philosophical, and historical forces which form contemporary Judaism, Catholicism, and Protestantism.


465. Seminar: Contemporary Western Religious Thought (3-0) Cr 3, or (3-1) Cr 4 F Pre-requisite: 6 credits in religious studies. Selected issues in contemporary religious thought including Protestant, Roman Catholic, Jewish, and secular thinkers.

475. Seminar: Issues in the Study of Religion (3-0) Cr 3, or (3-1) Cr 4 F Pre-requisite: 6 credits in religious studies. Selected issues in contemporary religious thought including Protestant, Roman Catholic, Jewish, and secular thinkers.

490. Independent Study (1-4 each time taken) Cr 1-4 each time taken. Pre-requisite: Permission of instructor approval of program chairman. Guided reading and research on special topics selected to meet the needs of advanced students.

590. Special Topics in Religious Studies. (2 to 4 each time taken. Pre-requisite: Permission of instructor) 9 credits in religious studies.

A Western Religions

B Eastern Religions

C Religious Thought

D Religion and Culture

*Optional fourth credit with permission of instructor entails guided research or other complementary study

*Optional fourth credit entails guided research or other complementary study

Sciences and Humanities Cross-Disciplinary Studies

Richard J. Van Ilen, Associate Dean for Academic Programs and Services

Millard R. Kratchvill, Assistant Dean

Ruth W. Swenson, Assistant Dean

Cross-disciplinary studies in the College of Sciences and Humanities provide an administrative base for programs of study and courses that cross established departmental lines.
Individual Major

The individual major in the undergraduate curriculum of the College of Sciences and Humanities, leading to either the Bachelor of Arts or the Bachelor of Science degree, is designed to provide program depth in an area of student interest that bridges regular academic majors. The major consists of 27 to 40 credits of carefully planned, coherent course work in more than one department; it is not to be used to create a theme to "pull together" courses already taken. This major must have a descriptive title that reflects its theme and content. The title appears in parentheses on the transcript following the words Individual Major. There are no predetermined or defined areas of interest except that the individual major will not be used if the student's interests could be well served by any reasonable combination of existing majors, minors, and electives.

One-half or more of the 27 to 40 credits in the major normally will be in courses in departments of the College of Sciences and Humanities. No individual major will be approved if the area of interest properly falls under the purview of another college of the University except by specific permission of the dean of that college. At least 20 credits in courses applied to the individual major should be at the 300 level or above.

Admission to the program requires approval during the sophomore or junior year and all students are required to earn at least 30 credits after the semester in which the degree program is approved. The application and the degree program must be approved by the Individual Major Review Board and the dean before admission to the program. The board will determine that sufficient university resources are available and that they are utilized in the program to insure reasonable depth of study in the student's area of interest. The other degree requirements are those prescribed for the curriculum in sciences and humanities (see Index, Sciences and Humanities, Curriculum) The student's application and degree program must be supported by an adviser who is qualified to counsel competently in the student's area of interest. The adviser must hold an appointment in the College of Sciences and Humanities unless there is special approval of another university faculty member by the dean. Details of this program and procedures for making application are available in the office of the dean, College of Sciences and Humanities.

Major in Distributed Studies

For a student whose educational or professional goals can best be met by a broad, flexible curriculum, the Distributed Studies major offers an opportunity to design a program suited to individual academic needs.

Programs in Distributed Studies are appropriate preparation for professional studies in human health-related fields (i.e., human medicine, medical technology, physical therapy, physician's assistant, cytotechnology, dentistry, nursing, and optometry), law, speech-language pathology and audiology, theology, and veterinary medicine. With careful planning of courses during three years of preprofessional work at Iowa State University, students in human health-related fields or veterinary medicine may be able to transfer up to 32 appropriate credits earned during the first year in a professional school and meet the requirements for a bachelor's degree from this university. Programs in Distributed Studies are also appropriate for preparation for teaching in secondary schools (see Teacher Education below).

The basic degree requirements are those established for the curriculum in sciences and humanities (see Index, Sciences and Humanities, Curriculum). Instead of requiring courses within one discipline for a major, however, the Distributed Studies major requires a minimum of 48 credits in three areas of concentration of at least 15 credits each. All courses in these areas must be numbered 200 or above, in addition ½ or 32 credits must be numbered 300 or above. (100-level courses in these areas of concentration may be used to meet concentration requirements, but courses numbered 200 or above may not be included in the four groups.) Of the three areas of concentration, only one may be taken in a department outside the College of Sciences and Humanities. Courses within various university departments may be combined to make a meaningful area of concentration. The areas selected should provide a cohesive whole related to the student's educational goals.

The Distributed Studies major must satisfy the following general education requirements:

A. Students must earn the minimum credits listed in each of the four general education groups of the College of Sciences and Humanities.

B. Students must earn an additional 12 credits in the groups in departments and subject areas not included in the three areas of concentration. Students who have completed 3 years of one foreign language in high school will be exempt from the foreign language requirement and will be required to take 12 additional credits in the groups in departments and subject areas not included in the three areas of concentration.

C. The following requirements must also be met:

1. Credits earned in meeting the following requirements may be used in the general education groups if not used in an area of concentration.

2. A student using one of the social sciences as an area of concentration must take a minimum of 6 credits in mathematics, including calculus (when appropriate, statistics may be substituted for calculus).

3. A student having only one area of concentration in the physical sciences must complete one year of course work in a natural science other than the one chosen as an area of concentration. A student having an area of concentration in the physical sciences and an area of concentration in the biological sciences would be excused from this requirement.

4. A student using one of the biological sciences as an area of concentration must take a minimum of 6 credits in mathematics, including calculus (when appropriate, statistics may be substituted for calculus) and one year of course work in chemistry. In addition, coursework in physics is recommended.

5. A student having only one area of concentration in the humanities must take the equivalent of a two-semester sequence in another of the humanities or in the arts in addition to the sequence required in Group 1.

A Distributed Studies major must complete one year of college-level study in a foreign language or demonstrate equivalent proficiency. Students who have completed 3 years of one foreign language in high school will be exempt from the foreign language requirement and will be required to take 4 instead of 12 additional credits in the groups in departments and subject areas not included in the three areas of concentration.

English proficiency will be certified if a student has grades of B or better in English 104 and 105. A student not meeting this requirement must take an advanced composition course (Eng 204, 302, 305, 414) and obtain a grade of C or better to be certified as proficient in English.

Students planning to use the first year of professional school work toward a degree at Iowa State may transfer up to 32 appropriate credits in meeting the requirements for a bachelor's degree in the College of Sciences and Humanities. Up to 21 of these credits may be distributed among three appropriate areas of concentration, or 15-18 transferred credits may be used to comprise one area but not applied in the other two areas. The remaining transferred credits may be applied as electives.

Students planning to pursue a preprofessional program may designate a Distributed Studies major on entering the University or may enter in the Open Option category and subsequently declare a Distributed Studies major. Except for students who are entering traditional preprofessional programs, such as prelaw and premedicine, students already enrolled who desire to change from another major to Distributed Studies should be asked in writing how their educational goals can be met with a Distributed Studies major. This application letter is to be submitted to the Associate Dean for Academic Programs and Services and approval granted before a program can be implemented.

Further information may be obtained from the College Office.

Cross-Disciplinary Programs

American Indian Studies Program (Minor only)


The American Indian Studies Program promotes an awareness of and sensitivity to the American Indian in cross-cultural and cross-disciplinary perspectives. It includes courses in anthropology, English, history, and sociology and should be especially valuable to students mapping in those areas in the College of Sciences and Humanities. The courses are also relevant to students in home economics and education. The courses in the American Indian Studies Program provide added background for students whose career interest may include multi-cultural education, human services programming, legal services, or public administration. For further information see Index, American Indian Studies. A list of suggested courses and other information can be obtained from the Dean, College of Sciences and Humanities.
The Biology Program at Iowa State allows students to undertake broad studies in the life sciences without the specialization inherent in a departmental major. Six life science departments (Animal Ecology, Biochemistry and Biophysics, Botany, Genetics, Microbiology, and Zoology) participate in the administration of the Biology Program. Instructors and advisers are members of the staff in one of these departments. For a description of the program and courses see Index, Biology.

Environmental Studies Program (Second major only)
Coordinator: Craig B. Davis

Students wishing to major in environmental studies in the College of Sciences and Humanities must also complete the requirements for a disciplinary major in that college. Environmental Studies may be taken only as a second major.

Students pursuing an environmental studies major must complete the full Environmental Studies Program and the following cognate courses:

I. Chemistry 163, 163L, Physics 111, Biology 110, and Geology 100
II. One of the following courses: Chemistry 231, Physics 312, Microbiology 300, or Meteorology 301
III. One course in each of the following disciplines: statistics, economics, sociology or anthropology, and political science. Courses selected must be approved by the coordinator of environmental studies.

Informational Studies Program (Second major only)

See Index, International Studies Program

Linguistics Program (Minor only)
Program Committee: Clyde Thogmartin, Chair, S. Gonzos, M. Lee, D. Lampers, M. Mason, W. R. Underhill, M. Warren

A minor in linguistics may be elected by students in the curriculum in sciences and humanities. This minor enables students interested in the study of human language to design an integrated multidisciplinary program from courses offered by the departments of Child Development, English, Foreign Languages and Literature, Philosophy, Psychology, Sociology, and Anthropology. For further information, see Index, Linguistics.

Religious Studies Program (Minor only)

Religious studies gives students opportunity to investigate and reflect on the religions of mankind in an objective, critical, and appreciative manner. Though there is emphasis in religious studies on the wide variety of religious phenomena as well as on the various methods in the study of religion, the aim is to help students to develop their own integrated understanding of the nature of religion and its role in the life of mankind. For further information see Index, Religious Studies.

Women's Studies Program (Minor only)
Program Committee: Linda R. Galyon, Chair, R. W. Bernard, G. M. Ebert, B. A. Glatz, K. K. Hiekk, M. Y. Lee, J. S. Rasmussen, two student members

The Women's Studies Program is designed to provide an opportunity for students to examine the contributions, experiences and roles of women within the context of biology, family, religion, educational, political, social, cultural and economic systems. It includes "core" courses in English, economics, history, physical education, political science, psychology, sociology, and additional courses in other areas. Students wishing to elect a minor in women's studies should contact the chair of the Women's Studies Program Committee. A list of suggested courses and other information is distributed to all women's studies minors and can also be obtained from the dean, College of Sciences and Humanities, or the chairperson of the Women's Studies Program. See Index, Women's Studies.

The Honors Program in Sciences and Humanities
Program Committee: Paul E. Nelson, Chair, J. Bower, S. Crossigny, G. S. Cox, A. Steiner, E. Yeung, two student members

The Honors Program is intended for ambitious students who have a 3.5-4.0 grade point average or higher. An honors student who completes his or her honors program will have that accomplishment recorded on the official transcript and on the diploma. Honors students are expected to take two honors courses and two honors seminars, to complete a program consistent with the honors guidelines, and to complete an honors project. For further information call or visit the Honors Program Office at Osbom Cottage.

Teacher Education Program
Program Committee: Clar. Keller, Chair, T. Andre, W. Chatfield, L. Hodges, D. Johnson, K. Knappas, R. Lambert, two student members

Students in the College of Sciences and Humanities may be recommended for the Iowa Professional Certificate for full-time teaching in secondary schools where the subject to be taught is biology, chemistry, earth sciences, English, foreign languages, general science, journalism, mathematics, music, physical sciences, physics, social studies, or speech. Students wishing teaching certification in one of these areas need not have that major, although it is usually convenient to do so. Candidates for admission to teacher education must make formal application to the Teacher Education Committees of the College of Sciences and Humanities at least three semesters before the one in which they plan to enroll in student teaching. A 2.0 grade-point average is required for admission to the Teacher Education Program, and this minimum average must be maintained through graduation. Students in the Teacher Education Program in Sciences and Humanities must earn at least 6 semester credits with a grade of C or better in courses used to meet their department's English proficiency requirement. Specific courses taken to be used for certification may not be taken Pass/No Pass. The specific course work requirements for certification and for a degree with a major in the College of Sciences and Humanities are set forth below.

Group Requirements
In addition to meeting Sciences and Humanities group requirements, the following must be included:

A. 1 credit in health, dance, physical education or art
B. Psych 230
C. A course in American History or American government
D. Sp 211 or 212

The Professional Education Requirement

Foundations of American Education — Sec Ed 204
Instructional Media — Sec Ed 301
Educational Psychology — Psych 333
Principles and Issues of Secondary Education — Sec Ed 426
Multicultural Awareness — Sec Ed 406*

*Plus 2 additional approved courses to fulfill human relations requirement from the following list: C 542: Anthr 218, 322, 323, 333; Pol S 385, Psyg 348; F E 385. Ed 450, Hist 273, 366; Soc 300, 327, 529; Eng 345, 346, 347, 348, 349, 514; Ed Ed 528. Additional courses may be added.

Student Teaching and Special Methods

Biology — Sh 417D 2nd 8 wks, F, S, 486
Chemistry — Sh 417B 2nd 8 wks, F, S, 486
Earth sciences — Sh 417J 2nd 8 wks, F, S, 486
English — Eng 494, S, 417E 1st and 2nd 8 wks, F, S
Foreign languages — F Lng 476, Sh 417G 2nd 8 wks F, 1st 8 wks S
General science — Sh 417B 2nd 8 wks, F, S, 486
Journalism — Jl MC 480, Sh 417I 1st & 2nd 8 wks F, 1st 8 wks S
Mathematics — Math 497, Sh 417C 2nd 8 wks F
Music — Music 464 or 465, 466, Sh 417K and/or 417L 2 8-wk sessions, S
Physics — Sh 417B 2nd 8 wks, F, S, 486
Social studies — Sh 417A 2nd 8 wks, F, S, 487
Speech — Sp 495, Sh 417F 1st and 2nd 8 wks, F, S

*Students seeking K-12 music certification and teaching student-teach the first 12 weeks of the first semester.

Subject Matter Courses

For full-time teaching in secondary schools an approved subject matter concentration of at least 30 credits is required. Additional certification in some areas is possible by earning 20 credits in each of those respective areas. All the minor number of subject matter credits in an area of specialization in the College of Sciences and Humanities should carry a grade of C or better. Required credits in the area of specialization which carry a grade of F or D must be repeated with a grade of at least C or, with the approval of the area supervisor, may be supplemented with an equal number of credits that carry a grade of at least C and are in the same area and beyond the minimal requirement. Exceptions may be approved by
Biology
Coordinator: George Knaphus

Students seeking approval to teach biology must earn credits in the following courses:
- B 301; or 404 and 405
- Biol 110, 110L, 303, 312
- Bot 207, 202 or 206, 310 or 404 or 405
- Gen 320 or 330
- Micro 300
- Zool 206, 206L, 355

One course from:
- A Ec 320, 320L, Ent 370, Zool 434

Chemistry
Coordinator: Wilbert Hutton

Students seeking approval to teach chemistry must earn credits in the following courses:
- General and analytical chemistry 177, 377L, 210; or 163, 163L, 164, 211
- Organic chemistry 331, 332, 333A, 334A
- Inorganic chemistry 301
- Physical chemistry 321, 321L
- Phys 221, 222

Students seeking approval to teach chemistry as an additional area must earn credits in the following courses:
- General and analytical chemistry 177, 377L, 210; or 163, 163L, 164, 211
- Organic chemistry 331, 332, 333A
- Inorganic chemistry 301 (permission to take 301 without 321 prerequisite) or
- Physical Chemistry 321 or 324
- Phys 221

Earth Sciences
Coordinator: Frederick DeLuca

Students seeking approval to teach earth sciences must earn credits in the following courses:
- Geol 100 or 210, 211, 241, 365, 3026
- Meteor 206
- Astro 120, 150
- Geog 100

Students seeking approval to teach earth sciences as an additional area must earn credits in the following courses:
- Geol 100 or 210, 211
- Meteor 206
- Astro 120
- Geog 100

Courses 300 or above — 3 credits.

English
Coordinator: Richard J. Zbaracki

Students seeking approval to teach English must earn credits in the following courses:
- Core requirements: Eng 210, 246, 204 or 304 or 305, 219, 220 or 419 or 420
- Studies in literary history: 6 credits from Eng 300, 361, 362, 363, and 6 credits from 373, 374, 375, 376, 377, 378
- Studies in genres, authors, or criticism: 3 credits from: Eng 366, 370, 391, 392, 449, 473, 474, 489
- Composition and linguistics: 6 credits from: Eng 204, 304, 305, 306, 404, 405, 220, 419, 420, 495, Soc 405, Psych 413, Sp 306
- Reading: Eng 395

Foreign Languages and Literatures
Coordinator: Walter Chatfield

Students seeking approval to teach a foreign language must earn credits in that one foreign language, in the courses indicated below:
- at least 34 credits must be earned. Full certification requires Foreign Language 476
- French: 301, 302, 321, 322, 401, 402
- German: 301, 302, 401, 402, and 6 additional credits from any 300- or 400-level courses
- Spanish: 301, 302, 321, 322, 401, 402
- Russian: 301, 322, 322, 401, 402

Prior to receiving approval in any of the modern languages the candidate must demonstrate adequate speaking proficiency in the language to be taught, as stated by departmental policy.

Students seeking approval to teach one of the above foreign languages as an additional area must earn 22 credits in that language. 6 of these courses must be in composition and conversation at the 300 or 400 level.

In addition to the above languages, students may seek approval to teach Latin, Greek and Portuguese as an additional area by taking 22 credits in that language. 6 of these credits must be in 300-level courses or above. Latin also requires History 403. Greek also requires History 402

General Science
Coordinators: Frederick DeLuca, James Dixon, Wilbert Hutton, George Knaphus

Students seeking approval to teach general science must earn credits in the following courses:
- Biol 110, 110L, Bot 207
- Chem 321, 321L, 321L, 322, 322L, and 3 credits from 311T, 399 (2 cr) and
- Phys 221, 221L, 431, 434, 440, 450, 462, 464

Students seeking approval to teach general science as an additional area must earn credits in the following courses:
- Phys 101, 201, 202, 301, 370, 430, 480, 491, 499, one course from 317, 318, 325, 342, 345, 352, 354, 360, one course chosen from 410, 435, 438, 440, 462, 464

Students seeking approval to teach general science as an additional area must earn credits in the following courses:
- Phys 101, 201, 202, 312, 370, 480, and at least one additional 300- or 400-level course

Mathematics
Coordinator: William Rudolph

Students seeking approval to teach mathematics must earn credits in the following courses:
- Math 165, 166 (or 175, 176), 301, 270 or 307 or 302, 435, 436, 489, Com S 111 or 117, Math 304 or Stat 341, plus an additional 6 credits in mathematics, computer science (except Com S 200 or 201), or statistics (except Stat 227 or 228)

Students seeking approval to teach mathematics as an additional area must earn credits in the following courses:
- Math 165, 166 (or 175, 176), 301; 270 or 307 or 302; 435; 489; Com S 111; Math 304 or Stat 341

Music
Coordinator: David Woods

Students seeking approval to teach music (kindergarten through grade 12) must earn credits in the following courses:
- C D 226
- Music 119, 120, 219, 230, 301, 319, 330, 331, 361, 362, 419, 3 credits of advanced music theory, and 3 credits of advanced music theory
- Music 360, 465 and 466 are required for students planning to teach vocal music
- 466 are required for students planning to teach instrumental music

A student seeking approval to teach only on the elementary or secondary level should confer with the Department of Music concerning modification in this program

Physical Sciences
Coordinators: Frederick DeLuca, James Dixon, Wilbert Hutton

Students seeking approval to teach physical sciences must earn credits in the following courses:
- Astro 120, 150, or 344, 345
- Chem 163, 163L, 231, 232
- Geol 100 or 210
- Meteor 206
- Phys 111, 112, or 221, 222
- Three credits from courses numbered 300 and above in astronomy and astrophysics, chemistry, meteorology, physics, and geology

Students seeking approval to teach physical sciences as an additional area must earn credits in the following courses:
- Astro — 3 credits from 120, 150
- Phys 111, 112, or 221, 222
- Chem 163, 163L
- Meteor 206
- Geol 100 or 210

Physics
Coordinator: James E. Dixon

Students seeking approval to teach physics must earn credits in the following courses:
- 221, 221L, 222, 222L, 311T, 399 (2 cr), 321, 321L, 322L, and 6 credits from Phys 304, 361, 364

Students seeking approval to teach physics as an additional area must earn credits in the following courses:
- Phys 221, 221L, 222, 222L, 311T, 399 (2 cr) and 3 credits from 321 or Astro 344

Social Studies
Coordinator: Clair Keller

Students seeking approval in all areas of the social studies must complete one of the following options:
- Option I: 54 semester credits distributed as follows: American history 6, world history 9, economics 12, sociology 12, political science 12, geography 3
- Option II: 54 semester credits distributed as follows: American history 12, world history 12, economics 9, sociology 9, political science 9, geography 3

Students seeking approval to teach in specific areas of the social studies must complete 12 semester credits in each of three areas and take
one course in each of the remaining three areas.
Total 45 semester credits

### Economics
Econ 201, 304, 306, 312, 401, 402, 404, 405, 406, 410, 445, 446, 455, 461, 465

### Sociology

### American Government

### Geography
Geog 100, 202, 301, 324, 325, 326, 328, 490, 495

### United States History
Credits as needed with at least one course from each group:
- Group 1: 221, 351, 381, 450, 451, 452, 454, 455, 482, 485, 467
- Group 2: 222, 275*, 352, 370, 382, 386*, 457, 458, 459, 483, 464, 468

### World History
Credits as needed with at least one course from each group:
- Group 1: 201, 265, 325, 401, 402, 403, 405, 406, 407, 408, 427, 428
- Group 2: 202, 326, 410, 411, 412, 414, 416, 417, 419, 421, 422, 424, 426, 430, 431
- Group 3: 207, 208, 211, 336, 337, 340, 341, 436, 441

### Speech
Coordinator: Frances S. Langford
Students seeking approval to teach speech
must earn credits in the following courses:
Sp 216, 256, 305, 311, 322, 332, 358, 360, 375, 412, 455, 456

Courses applicable to fulfill human relations requirement

### Courses Primarily for Undergraduate Students

#### Orientation and Introduction to Career Planning
Materials for Open Option Students (2-0) Cr 0.5 F S
Last 12 weeks. Orientation to university resources, guided analysis of interests and abilities, facilitation of decision-making skills and goal setting, visits with faculty and professionals in fields of potential career interests to individual students. Offered on a satisfactory-fail basis only.

#### Career Development for Open Option Students (2-0) Cr 2 S
An in-depth exploration of career development theory and careers that correspond to the student's major. Provided in small sections to provide an opportunity for intensive self-analysis in relation to personal career development.

#### Orientation to Medical Technology
(1-0) Cr 0.5 F First 6 weeks. Prereq: Sophomore classification. Nature and responsibilities of the profession, preprofessional education, internship, expertise, certification, employment opportunities. Offered on a satisfactory-fail basis only.

#### Elementary Physical Science I
(1-4) Cr 3 F. For students in elementary education and child development. Topics are selected from astronomy, weather, mechanics, light, sound, geology.

#### Elementary Physical Science II
(1-6) Cr 3 S. Prereq: 111. For students in elementary education and child development. Topics are selected from chemistry, electricity, magnetism, heat, geology, astronomy.

#### Pre-Veterinary Medicine Orientation
(1-0) F First 6 weeks. Prereq: Permission of instructor. Integration of pre-veterinary medicine, skills, curriculum requirements, university policies, procedures, and resources. Veterinary admission policy. Required of all transfer and pre-veterinary medicine students enrolled in the College of Sciences and Health Professions.

#### Career Orientation for Pre-Vet Students
(1-6) Cr 0-5 S. First 6 weeks. Presentations by veterinarians in practice, research, and special fields on career opportunities within veterinary medicine and in related areas. Examination of majors through experience in analyzing individual interests, abilities, and needs. Offered on a satisfactory-fail basis only.

#### Cross-Cultural Explorations
Introduction to World Cultures (3-0) Cr 3 F. A world belief systems, family patterns, historic settings, linguistic expression, artistic tastes, and political environment are considered. A study of six major world cultures. presentation of a cross-disciplinary faculty and a staff of international resource persons.

#### The Individual, Nature and Society: The Ancient Period
(3-0) Cr 3 F. Interests and opportunities for students in the University Honors Program. Using the literary, philosophical, historical, political, and artistic works of a selected time period, this course will examine how the individual viewed himself in relation to society and the physical world. A selected time period may vary according to the instructor. More specific information concerning course content may be obtained at the Honors Office.

#### The Individual, Nature and Society: The Modern Era
(3-0) Cr 3 S. Interests and opportunities for students in the University Honors Program. Using the literary, philosophical, historical, political and artistic works of a selected time period, this course will examine how the individual viewed himself in relation to society and the physical world. A selected time period may vary according to the instructor. More specific information concerning course content may be obtained at the Honors Office.

#### Special Problems
Cr 1-3 each time taken. Prereq: Freshman or sophomore; permission of instructor.

#### Student Teaching
(4-0) Cr 6-8 each time taken. F S Prereq: Engr 494, or F Lng 476, or J Lng 476, or MC 480, or Math 497, or Music 465, or S-H 486 or 487 or Sp 246 or 445. Admission to teacher education, approval of coordinator during semester before student teaching. Observation, evaluation of instruction, lesson planning, and teaching in the sciences and humanities.

#### Special Preparation in Subject Matter
(1-0) Cr 3 First 8 weeks. Prereq: Admission to teacher education, 15 credits in subject-matter field. Topics may include preparation for instruction, spectrum of teaching methods, motivational techniques, safety and discipline, conducting field trips, and application of teaching and learning theory. Field trips, placement and additional instruction.

#### Methods of Teaching Social Studies
(2-0) Cr 2 (2-3) Prereq: F S Prereq: Admission to teacher education, 15 credits in subject-matter field. Topics include objectives, questioning strategies, classroom activities, differences in instruction, multi-cultural and non-sex education, and evaluation. Students taking 417A enroll for 3 credits, others optional.

#### Independent Study
Cr 1-3 each time taken. Prereq: Junior or senior classification. Permission of instructor.

*These course numbers may be used only with the permission of the Dean of the College of Sciences and Humanities and concurrence of the Sciences and Humanities Curriculum Committee.

### Secondary Education

#### Harold E. Dills, Head of Department

**Professors:** Bath, Brown, Burkholder, Charles, Crawford, Dills, Fanslow, Glass, Hoerner, Hughes, Hunter, Kahler, Keith, Keller, Knaphus, Kniker, Rasmussen, Schoeneke, Schneider, L. G. Smith, Volker, Williams, Zbaracki

**Associate Professors:** Andre, Carter, Dake, DeLuca, Fowler, Gengen, Irwin, Jarchow, Prye, Rudolph, Schultz, Simonson, F. M. Smith, Tannor, Williams, Wood, Woods

**Assistant Professors:** Arnes, Chatfield, Christensen, Ebert, Gilbert, Hausafus, V. Jones, Kent, Kroll, Langford, Miller, Payne, Ralston, Ransom, Torrie

**Instructors:** Townsend, Underwood

#### Undergraduate Study

Students seeking recommendations for a certificate to teach in the secondary schools must be admitted to the teacher education program and pursue a program which includes the following professional sequence courses. These courses may be included in the major as selected by the student and approved by the Honors Office.

**Psych** 333, Sec Ed 204, 301, 406, 426, special methods, and student teaching in the area of specialization.

**All students** who are recommended by the head of the Teacher Education Program are permitted to teach in the secondary schools.

#### Graduate Study

Graduate programs with a specialization in curriculum and/or media are administered through the Department of Professional Studies in Education.

#### Courses Primarily for Undergraduate Students

(1-0) Independent Study. Cr 1-4

(2-0) Foundations of American Education (El Ed 204). 3 Cr 3 F S S. Goals of schooling, including the roles of teachers today, historical development of schools, educational reforms and alternative forms, and current philosophical issues in education. Presented by a faculty and a staff of international resource persons.

(1-0) Independent Study. Cr 1-4

191
280. Teacher Aide (El Ed 280) (0-2) Cr 1 or 2 F.S. Prereq: Credit or classification in 204. Field experience in classrooms of the area. Work with students under supervision of a professional educator. Offered on a satisfactory-fail basis only.

280. Independent Study. Credits 1 to 3. Offered on a satisfactory-fail basis only.

301. Instructional Media (El Ed 301) Cr 1 F.S. Prereq: 204, credit or classification in Psych 333, eligibility for and formal application submitted to the teacher education program, junior classification.

Design, production, presentation, and evaluation of educational media in specific subject areas. Analysis of commercially and locally produced software including multi-cultural and human relations materials. Planning, developing objectives, and techniques of teaching with media.

406. Multicultural Awareness and Nonsexism in the Classroom (El Ed 406) (2-1) Cr 2 F.S. Pre req: 301. Awareness and nature of cultural pluralism, need for multicultural education, educational principles and societal-cultural groups, their perceptions, contributions, and needs, problems and issues including prejudice, discrimination, racism, sexism in school, classroom, instructional materials, curriculum incorporation, analysis and development of instructional materials, multicultural interaction, design and execution of teaching strategies.

426. Principles of Secondary Education. (3 or 4) Cr 3 or 4. Pre req: 307. F.S.SS. The curriculum, classroom management, organization of schools, career planning, student evaluation, legal aspects of education, career education, human relations, support services, professionalism, and individualizing instruction. A planned field experience is a professional growth activity including the course. Students enrolling for four credits must complete an extended field experience.


476. Methods of Teaching Foreign Languages. (F L 476) See Foreign Languages and Literatures.

496. Methods of Teaching Science. (S 496) See Sciences and Humanities Cross-Disciplinary Studies.

487. Methods of Teaching Social Studies. (S 487) See Sciences and Humanities Cross-Disciplinary Studies.

490. Independent Study Cr 1 to 3. Pre req: Grade-point average of 2.5 or more for preceding two quarters.

A Music Education (Music 490A) See Music.

B Vocational and Educational Guidance

C Curriculum Construction

D Principles of Secondary Education

E Methods of Teaching

H Honors Program

I Educational Statistics

S Foundations of Education


495. The Teaching of Speech. (So 495) See Speech.


Undergraduate Study

The department offers work for the degrees Bachelor of Arts and Bachelor of Science with majors in sociology and anthropology, and work for the degree Bachelor of Science in public service and administration in agriculture.

Programs of study in sociology offered in both the College of Agriculture and the College of Sciences and Humanities are outlined in this section. Programs in anthropology are described under Anthropology. For the undergraduate curriculum in sciences and humanities, with majors in sociology and anthropology, leading to the degrees Bachelor of Arts and Bachelor of Science, see Sciences and Humanities, Curriculum. For the undergraduate curriculum in agriculture, with major in public service and administration in agriculture, leading to the degree Bachelor of Science, see Agriculture, Curriculum in Public Service and Administration in Agriculture.

College of Sciences and Humanities — Sociology

A major in sociology can serve as a liberal arts education, as preparation for various positions in social service and related occupations in business and industry, as background for professional education in areas associated with work, law, and theology, or as a basis for graduate professional training as a sociologist in academic, government, business, and industrial settings.

A program of study that meets the needs and interests of the student and department requirements will be developed in consultation with the major advisor. Programs of study will include 115, 134, 201, 302, 325, 341, and Stat 101. Programs are also available in sociology, economics, political science, and criminal justice.

The major in sociology requires two terms of work in groups I, II, and IV of general education requirements. Programs leading to a Bachelor of Science degree will emphasize additional course work in groups I and IV of the general education requirements. Programs leading to a Bachelor of Science degree will emphasize additional course work in groups II and IV of the general education requirements. Some of the possible fields of concentration are criminal justice system, community (urban and rural sociology) family sociology, industrial sociology, social science teaching, research methods and statistics, social change and sociology of development, complex organizations, human population and ecology, social psychology, sociological theory, and social work.

In consultation with their advisers, students may gain work experience and develop their skills in their field of concentration through the field observation and practice options of 454, 460, and 469.

College of Sciences and Humanities — Social Work Program

The Department of Sociology and Anthropology offers a program of concentration in social work. Social workers assist individuals, families, groups, and communities to satisfy their material, social and psychological needs. As planned-change agents, social workers also contribute to the development of social welfare policy. This program prepares students for professional employment in public and private programs, and for admission to graduate school. Graduates may go directly into the second year of graduate study in social work.

As sociology majors, students in the social work program take both the required courses for sociology majors and the required social work courses. When combined with electives, these courses present the student with knowledge of human behavior and the social environment, the generic skills of planned change for individuals, families, groups, and communities, and the ability to initiate and develop service delivery systems and social welfare policy.

Students must take 261 and make formal application before being admitted to the program. Usually during their senior year and following the social work course or by the second year and following the social work course. Students are placed in a human service agency under a field instructor. This program is accredited by the Council on Social Work Education. Upon graduation students may join the professional organization, the National Association of Social Work. Student membership is available for juniors and seniors.

Programs of study will include 115, 134, 201, 302, 305, 401, Stat 101, and may lead to a Bachelor of Arts or Bachelor of Science degree. In addition, programs of study for social work students will include 261, 300, 451, 462, 463, 464, and 469. Other courses such as 264, 310, 327, and 340 are strongly recommended. Social work students are advised to consult with the social work faculty and their major advisor in designing a program of study that will satisfy their particular interests.

College of Agriculture — Public Service and Administration in Agriculture

The curriculum in public service and administration is designed for students who desire an interdisciplinary education to pursue a career with agriculturally related governmental and private agencies, or with businesses and industries that are concerned with public services in agriculture. Students will explore the planning and implementing of agriculturally related programs in communities (town, city, or county), multicity state areas, states, regions, and at the federal level.

The curriculum has a broad base of general education subjects including credits in communications, mathematics, physical and biological sciences, social sciences, and humanities. The technical subjects represent a combination of sociology, economics, government, and technical agriculture, with emphasis on social and economic change, history of public services, complex organizations, interagency relationships, community leadership, community action, adaption and diffusion, group dynamics, land utilization, and political and legal behavior as they relate to agriculture and rural areas.

Graduate Study — Sociology

The department offers work for the degrees Master of Science and Doctor of Philosophy with majors in sociology and rural sociology and minor work for students majoring in other departments. For M.S. and Ph.D. departmental requirements, see Program of Graduate Study for Degrees in Sociology and Rural Sociology, available from the department office. Some of the fields of possible concentration are community studies and development, complex organizations, crime and deviance, environmental sociology, family, gerontology, methodology, population/ecology, rural sociology, social change and development, social organization, social psychology, and sociological theory. Within the sociology major students may specialize in anthropology at the master's level. The sociology department does not offer a nonthesis master's program.

Although the department stipulates no language requirement for either the degree Master of...
College of Sciences and Humanities — Anthropology

For course descriptions and programs in anthropology, see Anthropology

Sociology

Courses Primarily for Undergraduate Students

*112 Orientation to Public Service and Administration (3-0) Cr. 1 F

301 Social Problems (3-0) Cr. 3 Social Problems and groups participation in modern society.

305 Social Psychology: A Sociological Perspective (3-0) Cr. 3 F S SSS Prereq. 130 or 134 Examination of human behavior in a social environment with emphasis on the development of the self, interpersonal relations, attitudes, and social processes.

*310 Community (3-0) Cr. 3 F S SSS Prereq. 130 or 134 Comparative analysis of the institutional structure of rural, urban, and suburban communities, community as an ecological and social system, power relationships, areas of need, and unplanned processes of social change.

327 Sex Roles in Modern Society (W S 327) (3-0) Cr. 3 F S SSS Prereq. 130 or 134 Examination of changes in sex role learning, femininity-masculinity, sex-role conflicts, and gender patterns of social processes.

331 Social Inequality (3-0) Cr. 3 F S SSS Prereq. 130 or 134 Social status and social classes, stratification of American society, dimensions of poverty.

360 Deviant and Criminal Behavior (3-0) Cr. 3 S SSS Prereq. 130 or 134 The meaning, identification, and causes of deviant and criminal behavior. An introduction to the study of people’s relationship to environment, study of social organization.

377 Sociology of Religion (Relig 347) (3-0) Cr. 3 S SSS Prereq. 130 or 134 The social institution of religion relative to personality, social status, economic, political institutions and the role of religion in modern society. Emphasis on the religious system as a creative component, to be decided upon by the faculty supervisor and student. 40 credits of field experience (Soc 454, 460, and 462 may be counted toward the 42 hours of upper level courses and the total of 124 S credit hours required for graduation. No credits in Soc 454 may be used to satisfy minimum sociology requirements for sociology majors.)

406 Observation and Practice (Pract var F S SSS Prereq. 201, 302, 305, 307, 303, 307, 400 or 440, and other courses deemed appropriate by faculty supervisor, junior or senior standing, cumulative GPA of at least 2.2, permission of instructor. Supervised practice in industrial plants, business organizations, human service agencies, rural organizations, and governmental agencies. Offered on a student-faculty basis during the academic year. 47 hours of upper level courses and the total of 124 S credit hours required for graduation. No credits in Soc 454 may be used to satisfy minimum sociology requirements for sociology majors."

411 Community Action (3-0) Cr. 3 F S SSS Prereq. 130 or 134 Community analysis of mobilization and organization of human and social resource systems for social action programs.
Courses Primarily for Graduate students, major or minor, open to qualified undergraduates:

511. Intermediate Research Methods. (2-2) Cr. 3 F Prereq: 302. Research methods in sociology including both qualitative and quantitative approaches, problem selection, hypothesis formulation, designs, sampling, measurement, data collection and analysis. Proposals writing

512. Qualitative Methodology. (3-0) Cr. 3 Alt F, offered 1982 Prereq: 6 credits in sociology. Examination of qualitative research methods and techniques appropriate to the sociological evaluation of planned social action programs implemented by legislation and/or human service organizations

520. Social Psychology: A Sociological Perspective. (3-0) Cr. 3 F Prereq: 305 or Psych 280. Examination of cognitive, symbolic interaction, exchange, role-reference group, and dramaturgical approaches. Assessment of contemporary issues in social psychology

521. Small Groups. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 305 or Psych 280. Examination of alternative theoretical models and methods of studying small groups

522. Attitude and Attitude Change. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 305 or Psych 280. Analysis of theories of attitude and attitude change: current controversies between the theories, as well as supporting research

527. Socialization. (3-0) Cr. 3 Alt S, offered 1983 Prereq: 6 credits in sociology. Research and theory on human socialization throughout the life cycle. Socialization studied as an organizational process, impacts of social change on socialization content and processes

528. Minority Groups. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Perspectives in intergroup relations: minority in the modern world, examination of theory and research on intergroup relations, implications of research for policy

530. Social Organization. (3-0) Cr. 3 S Prereq: 6 credits in sociological and analytical issues associated with the study of group structure, contemporary theories of social organization, data analysis issues involving social organization

532. Organization and Their Environments. (3-0) Cr. 3 F, offered 1982 Prereq: 6 credits in sociology. Comparative analysis of complex organizations. Complex organizations as semi-open systems. Social problems and organizational effectiveness

533. Models of Community. (3-0) Cr. 3 Alt F, offered 1981 Prereq: 6 credits in sociology. Emphasis on different models of reference used in community analysis - community as an ecological unit, political, economic, social norms, and the role of personal commitment, and explanation of social and cultural change presented for each model

538. Sociology of Leisure. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Theories of leisure and social structure, the role of leisure in modern society, and the impact of leisure on society

540. Contemporary Theories of Social Change. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Contemporary theories of social change, modernization and development are critically examined, theoretical and methodological issues identified, supporting research explored, and, the applicability of theoretical models, concepts, and strategies to current national and international needs evaluated


548. Sociology of Environmental Resources. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Examination of the environmental resources and the patterns, correlates, and functions of leisure behavior. Consideration of conceptual and methodological problems in studying leisure

550. Principles of Population. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Examination and critique of demographic theory and research, contemporary environmental topics and issues, including social impact assessment, equity considerations in resource use, environmental quality movement, environmental values, energy conservation, land-use conflict, and natural resources management


562. Social Deviance. (3-0) Cr. 3 Alt S, offered 1983 Prereq: 6 credits in sociology. Examination of the social structure, social organization, and the environment. Ecological methods

566. Criminal and Juvenile Justice: Process and Institutions. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Examination of the criminal and juvenile justice systems. The dynamics of contemporary police, judicial, correctional institutions, and community-based rehabilitation programs are evaluated in the context of key historical developments, theory, and research

568. Political Sociology. (3-0) Cr. 3 Alt S, offered 1983 Prereq: 6 credits in sociology. Analysis of power, mass society, and elite formation. Sociological theory in its current interaction with policy

575. The Family in Changing Societies. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 6 credits in sociology. Analysis of the relationships of the family and other institutions, emphasis on rural-urban differences, the family model, and changing roles

576. Sociological Perspectives on Aging. (3-0) Cr. 3 Alt S, offered 1981 Prereq: 6 credits in sociology. Theoretical perspectives on the aging process, social and psychosocial changes accompanying aging, age consciousness in American society

590. Special Topics. Cr. 1 to 3 each term taken. Prereq: 6 credits in sociology, seniors or graduate classification

599. Research for Master's Thesis. 'A. Rural Sociology. B. General Sociology


Course for Graduation Students, major or minor

600. Intermediate Sociological Inquiry and Theory. (3-0) Cr. 3 Alt F, offered 1982 Prereq: 511 Units of sociological analysis. Taxonomies in sociology, concepts, subconcepts, levels of concepts. Elements of systematic sociological theory: propositions, explanation, prediction, causation. Use of sociological theory in research

595. Historical Sociological Theory. (3-0) Cr. 3 Alt F, offered 1982 Prereq: 6 graduate credits in sociology. Evolution of sociological thinking focusing on the era from the Enlightenment to 1900. Positivism, conflict and functionalist traditions, organization, and sociology of knowledge perspectives

600. Contemporary Sociological Theory. (3-0) Cr. 3 Alt S, offered 1983 Prereq: 2400 Credit hours. Contemporary sociological theory: functionalism, symbolic interactionism, conflict theories, phenomenology, exchange theories and others

611. Sociological Measurement. (3-0) Cr. 3 Alt S, offered 1982 Prereq: 511 Principles of measurement for major sociological variables. Foundations of measurement, types of sociological variables, construction of sociological measures, indices and scales, methods of data collection

613. Advanced Theory Construction and Causal Modeling. (3-0) Cr. 3 Alt S, offered 1983 Prereq: 511 Credit hours. Contemporary theory construction in sociology, models in sociology: formal strategies to theory construction, notion of causality in sociology, contemporary approaches to causal analysis


645. Applied Sociology. (3-0) Cr. 3 Alt S, offered 1983 Prereq: 6 graduate credits in sociology. Orientation of applied sociology, roles and institutional settings of applied sociologists, application of sociological theory and research to social problems

698. Seminars in Sociology. (3-0) Cr. 3 each

A. Social Theory and Research
B. Methodology
C. Applied Sociology

699. Dissertation Research

*A Rural Sociology
B. General Sociology

*Administered through the College of Agriculture. Courses not marked by an asterisk are administered through the College of Sciences and Humanities. 1Credit from only one of 130 and 134 may be applied toward graduation.

Speech

Linda J Busby, Acting Chair of Department

Professors: Brandt, Dearin, Drexlcr, Underhill, Wilson

Associate Professors: Busby, Connolly, Gouran, Myers, Nelson, Weaver


Instructors: Cox, Johnson, Steger, Stone

Undergraduate Study

The department offers introductory courses designed for all students as part of their general education, as a complement to professional training, and as an introduction to further study in the field.
A student electing to major in speech may submit a request to the advisor for courses in the Department of Speech. This program of courses may be of a general nature, or may emphasize any of the following areas: communicative disorders, interpersonal and tutorial communication, telecommunicative arts, theatre, or speech education.

To attain an undergraduate major in the Department of Speech, a student must present a minimum total of 24 credits in speech courses of which a minimum of 20 credits must be selected from courses at the 300 level or above. A student majoring in the department must complete 9 credits in writing courses with at least a 2.0 average, including English 104 and 106 or the equivalent. Major credits are limited to a maximum of 9 credits from 490A, 490B, 490C, 490D, 490E, and 490H.

Students who major in speech can prepare themselves for a wide variety of future employment opportunities, depending upon individual interests, background, and abilities. Some may wish to prepare for positions in theatre, radio, television, film, education, communication disorders, or related fields in business and communication. Alternately, students may select speech as a major in pursuit of a liberal arts education. Programs in speech also can prepare students for graduate study. An undergraduate speech major may be used as a background for medical, legal, theological, or other professional studies.

Students are encouraged to participate in the co-curricular activities sponsored by the department. These activities include Iowa State Forensics and the Iowa State University Theatre.

Speech Education. Students fulfilling the requirements for teacher certification prepare to teach speech, dramatic arts, and media at the secondary school level. In addition, they prepare to direct co-curricular and extracurricular activities.

Each student seeking teacher certification in speech must fulfill the requirements outlined in the Sciences and Humanities Cross-Disciplinary Study section of this bulletin. In addition, each student must maintain a 2.5 grade point average in all courses taken in the Department of Speech and all credits taken in the Department of Speech must carry a grade of "C" or better.

Communication Disorders

The curriculum is preprofessional and consists of courses in speech-language pathology and audiology, as well as in related disciplines such as psychology, child development, learning disabilities, zoology, and linguistics. In addition to this broad and basic academic background, the student has an opportunity to observe and participate as a student clinician in the Communication Disorders Clinic and acquire up to 150 clock hours of undergraduate clinical experience.

Successful completion of the preprofessional program prepares the student for graduate study in this field. A masters degree in communication disorders, additional supervised clinical experience at the graduate level, a clinical fellowship year, and a written competency exam are required beyond this program to practice the profession. A student must plan to attend another school for graduate work.

Interpersonal and Rhetorical Communication

The interpersonal and rhetorical communication area offers instruction to speech majors whose program emphasizes rhetorical and interpersonal communication as a field of study, and to students from various disciplines who seek to increase their understanding of communication theory and to improve their communication skills. The principal content dimensions of the area are interpersonal, small group, organizational, and public communication. Students emphasizing the area examine the processes and variables affecting communication in human relationships. Focus is on planning, presenting, analyzing, and evaluating messages. Communication may be studied from a critical perspective or from an experiential perspective.

Emphasis in the area prepares students to teach speech in high school, study law or theology, attend graduate school, or enter a variety of communication-related areas in business organizations. Communication skills in businesses are available to qualified students. The area's courses also provide a minor concentration for students in allied fields such as business administration, English, journalism, or foreign languages and literatures.

Telecommunicative Arts

The telecommunicative arts area includes television, radio, and film study. Students may choose courses in production, direction, writing, editing, announcing, performance, history, theory, management, and criticism.

The department maintains a unique relationship with two service units of the University that provide students in telecommunicative arts with modern studios and equipment. Advanced students produce and direct television programs during the evening hours in the studios of WOI-TV, the university-owned and operated commercial ABC-TV affiliate. Advanced film production students utilize equipment and facilities of the University Film Production Unit on Saturday mornings and during evenings. The basic telecommunicative arts courses are taught in Exhibit Hall, which contains radio and television studios, classrooms, and offices.

A student emphasizing telecommunicative arts is encouraged to take the following courses: 130, 231, 233, one of 237 or 238, 236, 331, and at least one of 434, 532, or 533.

Telecommunication Disorders

The interpersonal and rhetorical communication area offers instruction to speech majors whose program emphasizes rhetorical and interpersonal communication as a field of study, and to students from various disciplines who seek to increase their understanding of communication theory and to improve their communication skills. The principal content dimensions of the area are interpersonal, small group, organizational, and public communication. Students emphasizing the area examine the processes and variables affecting communication in human relationships. Focus is on planning, presenting, analyzing, and evaluating messages. Communication may be studied from a critical perspective or from an experiential perspective.

Emphasis in the area prepares students to teach speech in high school, study law or theology, attend graduate school, or enter a variety of communication-related areas in business organizations. Communication skills in businesses are available to qualified students. The area's courses also provide a minor concentration for students in allied fields such as business administration, English, journalism, or foreign languages and literatures.

Telecommunicative Arts

The telecommunicative arts area includes television, radio, and film study. Students may choose courses in production, direction, writing, editing, announcing, performance, history, theory, management, and criticism.

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A student emphasizing telecommunicative arts is encouraged to take the following courses: 130, 231, 233, one of 237 or 238, 236, 331, and at least one of 434, 532, or 533.

Theatre

The theatre area offers a wide variety of courses in dramatic theory and production. Students may select from a core of courses in acting, design, costume, stage lighting and sound, stage direction, theatre management, and theatre history. Independent study and special topics courses supplement formal course offerings to provide opportunities to intensify study in a particular aspect of theatre.

Students are urged to implement the theories and principles explored in the classroom in the State University Theatre regularly presents mainstage productions in the University of Iowa Theatre. The production program spans both the regular academic year and the summer sessions. Auditions for University Theatre productions are currently open to all students irrespective of academic major. Similarly, participation in areas of production other than acting is open to both departmental majors and nonmajors. Qualified students also present experimental and laboratory productions.

Ment and honor scholarships are awarded on a regular basis to students who make significant contributions to Iowa State University Theatre.

Graduate Study

The department offers courses for a graduate minor in speech as well as supporting work for other fields. Speech also participates in the interdepartmental program leading to a masters degree in General Graduate Studies.

Open to graduate students for minor credit only: 305, 327, 371, 376, 412, 433, 434, 436, 465, 466, 475, 477, 479, 480.

Courses Primarily for Undergraduate Students

Communication Disorders (Sp)

170 Speech Improvement (1-0) Cr 1 F S SS Development of effective speech habits; voice quality, articulation, expression, pronunciation.

270 Speech and Hearing Science (3-0) Cr 3 F Anatomy and physiology of voice; resonance, articulation, and hearing as related to speech, language, and hearing.

271 Phonetics (3-0) Cr 3 F S Analysis of speech through study of individual sounds, their variations, and relationships in context; practice in auditory discrimination and transcription of sounds of American English; description of speech sounds in terms of their production; transmission, and perception.

275 Introduction to Communication Disorders (3-0) Cr 3 F S SS Survey of speech, language, and hearing disorders of children and adults.

290 Special Projects Cr 1 to 2 each time taken maximum of 4 credits Preq 3 credits in Speech permission of department chairman

A Communication Disorders

H Honors

371 Language Development (3-0) Cr 3 F Prereq 275 Developmental process of language and speech; acquisition in children; pragmatics of children's communication.


379 Clinical Management of Communication Disorders (3-0) Cr 3 F Prereq 275 Principles and methods employed in the clinical management of communication disorders, preparatory for clinical practice. For those planning a career in communication disorders.


477 Fluency Disorders (3-0) Cr 3 F Prereq 275 Nature, etiology, assessment, and management of fluency disorders.

479 Practicum in Communication Disorders Cr 1 to 2 each time taken, maximum of 4 F S Prereq 379, 376 or 477 or 480, grade point average of 3.0 in communication disorders courses, permission of instructor


490 Independent Study Cr 1 to 3 each time taken Preq 9 credits in speech, junior classification, permission of department chairman

A Communication Disorders

H Honors

Interpersonal and Rhetorical Communication (Sp)

*211 Fundamentals of Speech Communication (3-0) Cr 3 F S SS Principles of communication; practice in preparation and delivery of extemporaneous speeches, additional practice in interpersonal communication.

*212 Fundamentals of Public Speaking (2-0) Cr 2 F S SS Principles of rhetoric in an advocacy situation.
215. Parliamentary Procedure. (2-0) Cr. 2 F

Principles and forms of parliamentary action governing conduct of business in legislative bodies. Emphasis on procedures for small groups as well as for larger deliberative assemblies.

223. Intercollegiate Debate and Forensics. Cr. 1 each time taken, maximum of 6 credits. F S Prereq. Permission of instructor. Participation in intramural or intercollegiate debate and other forensic events.

225. Nonverbal Communication. (3-0) Cr. 3 S SS

Introduction to nonverbal communication, paralinguistics, proxemics, kinesics, symbolism, signs, and object language.

290. Special Projects. Cr. 1 to 2 each time taken, maximum of 4 credits. Prereq. 3 credits in speech, permission of department chairman.

B Interpersonal and Rhetorical Communication
E Speech Education
H Honors

305. Semantics. (3-0) Cr. 3 F SS Prereq. Eng 105 Nature of symbolic processes, determination of meanings, major approaches to linguistic study, impact of verbal habits and patterns of relative awareness between language and thought in personal or social problems, accuracy in use of verbal symbols.

311. Interpersonal Communication. (3-0) Cr. 3 F SS Prereq. 211 Theory and principles of communication in the context of interpersonal, verbal and nonverbal language, the role of self and others in the communication process, cultural and subcultural differences, and rhetorical bases of effective communication.

312. Business and Professional Speaking. (3-0) Cr. 3 F S SS Prereq. 211 or 212 Principles and practice in common types of professional presentations: briefings, motivational, salaries, manuscript, and public relations presentations.

313. Communication for the Classroom Teacher. (3-0) Cr. 3 S SS. Prereq. 211 or 212 Communication in the teaching profession, training in class-oriented community discourse, and use of video recorder for analysis of presentation.

314. Organizational Communication. (3-0) Cr. 3 S SS Prereq. 211 Behavioral research and theories in organizational communication, communicative strategies for effective organizational functioning, application through related exercises.

315. Interviewing. (3-0) Cr. 3 F SS Prereq. 211 Theory and practice of communication in various kinds of business interviewing, application of speech communication theory and concepts to the interview setting.

317. Group Discussion and Leadership. (3-0) Cr. 3 F SS Prereq. 211 Development of communication skills in the practice of group discussion, information-sharing, problem-solving, and decision-making groups. Theories and techniques of leadership as applied to small group settings.

322. Argumentation and Debate. (3-0) Cr. 3 F SS Prereq. 211 or 212 Practice in preparing and presenting argumentative and debate speeches; emphasis on ethical and logical duties of the advocate, analysis, counterargument, attitudes, thesis defense, research, case construction, and judging.

327. Persuasion. (3-0) Cr. 3 F SS Prereq. 211 or 212 Examination of behavioral research in persuasion, scientific methods of evaluating persuasive communication, an emphasis on application of experimental research: audience analysis, attention, perception, suggestion, logical, emotional and ethical proofs.

412. Speech Criticism. (3-0) Cr. 3 F SS Prereq. 211 or 212 and 6 credits of Speech Development of rhetorical theory and practice from Corax to modern times. Application of principles of criticism to current public speaking practices.

416. American Public Address. (3-0) Cr. 3 S Prereq. 212 Relationship between public persuasions and leaders; process of preparing major public addresses, selected speakers and speeches as linked with political and social history.

417. Campaign Rhetoric. (3-0) Cr. 3 Alt. F offered 1982, Prereq. 211 or 212. Backgrounds of candidates for state and national elections, selected speeches and issues, persuasive strategies and techniques of individual speakers.
361. Scene Design. (3-0) Cr 3 Alt. S., offered 1983
Prereq. 360 Principles and practice in creating visual environment for performance of dramatic literature

362. Creative Dramatics. (3-0) Cr 3 F S SS Preq. 160 Junior classification. Study, improvisation and playwriting with children and adults

364. Lighting and Sound. (3-0) Cr 3 Alt. S., offered 1980 Prereq. 360. Theories and practice in design, use of lighting and sound for the stage

362. Arts Management. (3-0) Cr 3 F Preq. 9 credits in the visual or performing arts major or graduate classification. Related work as department head or program director. Open to students who desire to work in the performing arts. Field trip fee required

365. Directing (2-0) Cr 2 F Preq. 256, 360 Theory and techniques of stage directing

366. History of Theatre I. (3-0) Cr 3 F Preq. Hist. 201 Theatrical art from ancient times to 1800

367. History of Theatre II. (3-0) Cr 3 S Preq. 465 Theatrical art from 1800 to present

369. Theatre Practicum. Cr 1 to 2 each time taken. Maximum of 6 credits. F S SS. Preq. 9 credits in theatre courses, junior classification and theatrical experience. Practicum in theatre including musical, stock, or repertory theatre involving production, rehearsal, and performance with opportunities for specialization within various areas

400. Independent Study. Cr 1 to 3 each time taken Preq. 9 credits in speech, junior classification, permission of department chairman. D Theatre H Honors

Courses Primarily for Graduate Students, Major or Minor, open to qualified undergraduates.*

504. Seminar. Cr 1 to 3 each time taken. F S SS Preq. 9 credits in speech. Topics may be included in the following areas:
   A. Communication Disorders
   B. Interpersonal and Rhetorical Communication
   C. Telecommunication
   1. Mass Media and Society
   2. Women, Minorities, and Mass Media
   3. Broadcast Survey Research
   4. Film in Third World Culture
   5. Women and Cinema
   D. Theatre
   E. Speech Education

510. Classical Rhetoric. (3-0) Cr 3 S Preq. 12 hours of speech, Greek and Roman tradition in rhetorical theory, practice, criticism, and pedagogy

532. Radio Research and Programming. (2-2) Cr 3 each time taken, maximum of 6 credits. S Preq. 330 or graduate classification. Research methods, program formats, editing, and management principles as related to radio

533. Broadcast Program Production. (2-3) Cr 1 to 3 each time taken, maximum of 6 credits S Preq. 433 Topics selected by students for half-hour programs. Research, planning, production, and direction in WOI studios

536. Film Practicum. (1-6) Cr 3 each S Preq. 435 Application of production techniques in a complete 16 mm or 35 mm color film project of professional quality. Students work together as a team. The project evolves from conception to completion including research, scripting, filming, sound recording, animation, editing, and the completion of the project

551. Advanced Acting. (3-0) Cr 3 Alt. S., offered 1983 Preq. 351. In-depth study and practice of period pieces and acting styles

555. Directing Practicum. (1-2) Cr 2 S Preq. 455 Practice experience in directing the stage play

565. Directing the Educational Theatre Program. (3-0) Cr 3 SS Preq. 9 credits in educational theatre, classroom selection and new dramatic literature, theatre management, directing college and high school drama programs, conducting high school drama contests and festivals

563. Theory and Criticism of Dramatic Production. (3-0) Cr 3 SS Preq. 6 credits in theatre or dramatic literature. Examination of critical theories of play production from Aristotle to modern critics

590. Special Topics. Cr 1 to 4 each time taken, maximum of 12 credits Preq. Permission of department chairman

A. Communication Disorders
B. Interpersonal and Rhetorical Communication
C. Telecommunication
D. Theatre
E. Speech Education

599. Research.*
   *Open to junior and senior-level students with a grade point average above 3.0

Statistics

Herbert A. David, Head of Department

Professors: Atreyu, C. P. Cox, D. F. Cox, H. A. David, H. T. David, Fuller, Ghosh, Groeneveld, Han, Harville, Hickman, Hin, Hotchkiss, Isaacsorn, Kiernphome, Kennedy, Meeden, Polk, Sposito, Strahan, Wills

Emeritus Professors: Bancroft, Hunsberger, Strand

Associate Professors: Bailey, Booth, Meeker

Assistant Professors: Baker, Bubolz, Goebel, Johnson, Koehler, Lorenz, Marasgsige, Shelley, Stephenson, Sullahtme

Undergraduate Study

For the undergraduate curriculum in sciences and humanities, major in statistics, leading to the degree of Bachelor of Science, see Sciences and Humanities, Curriculum. For the undergraduate curriculum in biology see Agriculture, Curriculum

The curriculum in sciences and humanities with a major in statistics is designed to prepare students for (1) graduate study in statistics, and (2) positions in business, industry, or government. This work may include the following statistical design, analysis, and interpretation of experiments and surveys, statistical quality control, sample inspection, high-speed data processing, application of statistical principles and methods to industrial research and development, and industrial design and specifications. Operations research to analyze the performance of persons, machines, and processes under operational conditions, market, sales, advertising, and consumer research, cost and price analyses, newspaper, magazine, radio, and television research, psychological testing, public health studies. Also, there are opportunities for work in statistics that may require a major in a subject-matter field and a minor in statistics

Undergraduate majors in this department usually include the following basic courses in their programs:

101, 341, 342, 401, 402, 421, 480, 481. These courses plus two additional statistical courses at the 400 level or above constitute the major. It is advisable to have a minor in a field of application

The curriculum in microbiology is intended for those students who desire to apply mathematics and statistics to problems related to agriculture. The curriculum prepares the student to work with research scientists in agriculture, or for graduate study in related fields

Students intending to do graduate work in statistics normally would take additional courses in mathematics

Graduate Study

The department offers work for the degrees of Master of Science and Doctor of Philosophy with major in statistics, and minor work for students majoring in other departments. Within the statistics major the student may specialize in experimental design, probability, statistical methods, statistical theory, statistical computing, survey sampling, or applied statistics (e.g., biometrics, econometrics, psychometrics, sociometrics, etc.) A specialization in operations research is co-offered with the Department of Industrial Engineering. The doctor of philosophy degree is offered as a co-major with other departments. Such departments have included Agricultural Engineering, Agronomy, Animal Science, Economics, Forestry, Genetics, Industrial Engineering, Psychology, and Mathematics

Prerequisite to major graduate work is the completion of an undergraduate curriculum essentially equivalent to the curriculum in sciences and humanities at this institution including at least a year of calculus.

The degree Master of Science may be earned on either a thesis or nonthesis basis. The nonthesis option requires the completion of at least 34 credits of acceptable graduate work and satisfactory performance on a written examination.

The department encourages students to prepare themselves in foreign languages and in computer language, but specific requirements for the degrees master of science and doctor of philosophy are at the discretion of the student's advisory committee

Open to graduate students for minor credit only 401, 402, 403, 404, 405, 407, 421, 431, 432, 436, 447, 451, 480, 481

Courses Primarily for Undergraduate Students

100. Orientation in Statistics and Biometry (1-0) Cr 1 Prerequisites: None, and the scope of the curriculum in statistics and biometry. For students planning or considering a career in these areas

101. Principles of Statistics. (3-2) Cr 4 F S SS Preq. 175 years of high school algebra. Statistical concepts in modern society, frequency distributions, elements of statistical inference, estimation and hypothesis testing, contingency tables, linear regression and correlation, analysis of variance

104. Introduction to Statistics. (2-2) Cr 3 F S SS Preq. 175. College algebra. Statistical concepts with emphasis on experimental problems from biological fields. Summarizing statistical data, the normal distribution, estimation and tests of hypotheses, regression and correlation analysis, sample analysis of variance. For students in the agricultural and biological sciences

110. Introduction to Statistics. (2-2) Cr 2 F S Preq. Math 165 or 175. Statistical concepts with emphasis on engineering applications. Probability, distributions and their properties, elements of statistical inference, regression. For students in engineering

227. Introduction to Business Statistics. (2-2) Cr 4 F S SS Preq. Math 152 or 156. Obtaining, presenting, and organizing statistical data, means of location and dispersion, probability concepts, normal distribution, sampling and sampling distributions, estimation and tests of hypotheses, simple linear regression analysis


231. Probability and Statistical Inference for Engineers. (4-0) Cr 4 S Preq. Math 166 or 178. Emphasis on engineering applications. basic concepts, distributions,
301. Sequential Product and Process Control (E 531) (3-0) Cr 3 Alt S, offered 1983 Pre req. 343 or 447 Sampling, sequential analysis, estimation, Bayesar sampling, continuous sampling, and process control.


303. Ecological Statistics. (2-0) Cr 2 Alt S, offered 1983 Pre req. 447 or 542. Pollak. Models of population growth, growth of populations with two competing species, parasitic-host relationships, elementary population genetics, selection, mutation and migration, spatial patterns in populations with one or more spatial coordinates.

304. Statistical Data Analysis. (2-0) Cr 2 Alt S, offered 1983 Pre req. 101 or 447. Distributions, tests with continuous and discrete data, experimental units, randomization, replication. Analysis of data when dependent variable has ordinal or categorical data; testing hypotheses, linear hypothesis theory, estimation, distribution, introduction to analysis of variance, regression, multiple regression, and assignment.

305. Introduction to Probability and Statistical Theory. (3-0) Cr 3 Each 341, F S, 342, F S Pre req. 341, Math 327, probability distributions and their properties, sampling distributions, theory of estimation and tests of hypotheses, linear models, theory of correlation and regression, the multivariate normal distribution, nonparametric methods, sequential analysis.

401. Mathematical Methods for Research Workers. (3-2) Cr 4 F SS Pre req. 101 or graduate classification Statistics 169. The role of statistics in research and the principles of experimental design. Experimental units, randomization, replication, blocking, subdividing, designs for measuring experimental units, factorial treatment designs and confounding. Extensions of the analysis of variance to cover general crossed models and interactions and models that include both classificatory and continuous factors.

402. Nonparametric Statistical Methods. (2-0) Cr 2 Alt F, offered 1982 Pre req. 228 or 401. Groeneveld. Analysis of data when dependent variable has ordinal or nominal measurement. Statistical inference for ranked data, rank correlation, efficiency of nonparametric procedures and robustness of comparative parametric procedures.

403. Statistical Methods for the Social Sciences. (2-2) Cr 3 F Pre req. 401. Application of statistical methods to data in the social sciences, generalized linear regression models, covariance, miscellaneous estimation problems, including constructing complete measures, procedures with measurement error present.


411. Theory of Linear Models. (3-0) Cr 3 F Pre req. 400, 401 or 500. A. C. Goebel. Elementary and advanced techniques for analyzing multivariate data including Hotelling's T², multivariate analysis of variance, principal components, linear discrimination, canonical correlation.

500. Statistical Methods. (3-2) Cr 4 F Pre req. 101 and credit or classificatory credit in 579. Hinz, Koehler. Introduction to methods and analyzing data from experiments and surveys. Methods of analysis of variance including cross-classifications, correlation, multiple regression, introduction to multiple comparisons, contingency table analyses. Current computer software utilized in data analyses.

501. Multivariate Statistical Methods. (3-0) Cr 3 S Pre req. 401 or knowledge of matrix algebra. Koehler Elementary theory and techniques of analyzing multivariate data including Hotelling's T², multivariate analysis of variance, principal components, linear discrimination, canonical correlation analysis of categorical data including log-linear and logistic models.

502. Design of Experiments. (3-0) Cr 3 Alt F Pre req. 341. Kish. Basic ideas of experimental design with applications; completely randomized designs, randomized blocks, Latin square designs, Latin square designs with adjacent plots, analysis of variance and covariance, randomized complete block designs, split-plot designs, and the general linear model. Analysis of variance and covariance, randomized complete block designs, and the general linear model. Analysis of variance and covariance, randomized complete block designs, split-plot designs, and the general linear model.
Surveying

Administered by the Department of Civil Engineering

Rolland L. Hardy, Professor in Charge

Professors: Hardy, Javanacial
Assistant Professors: Montag

Undergraduate Study

For undergraduate curriculum in surveying leading to the degree Bachelor of Science, see College of Engineering, Curricula

Surveying is a curriculum administered by the Department of Civil Engineering. It is designed to provide a strong fundamental knowledge of engineering and areas of surveying specialization such as land surveying, engineering surveying, geodetic or control surveying, aerial surveying or photogrammetry, and cartographic surveying for original maps, charts, or other cartographic products.

Graduates of this curriculum may expect to be involved professionally in the planning, design, and responsible execution of surveying and mapping operations.

Professional registration as a surveyor occupies a unique position among the several classifications licensed by the state boards of engineering and surveying examinees. Generally, the professional surveyor is the only registered professional who can practice in the specialty of property (land) surveying. Many registered surveyors form consulting firms and practice only in land surveying or in land surveying and other specialties of surveying. Others become key professionals in consulting firms engaged in both civil engineering and surveying.

Career opportunities also exist in industry and government employment by industry frequently involves professional work with aerial surveying or photogrammetric engineering firms involved in map production. Some such firms are also involved in research, development, design and testing of advanced geodetic and photogrammetric systems. Federal, state, and local government activity involves large-scale systems, subdivision design review, and other administrative or legal control matters.

A cooperative education program is available for students in surveying. See Cooperative Programs, College of Engineering.

For description of courses, see Civil Engineering

Graduate Study

Work for the Master of Science with a major in geodesy and photogrammetry is administered by the Department of Civil Engineering. For description of courses, see Civil Engineering

Technology and Social Change

(Interdepartmental Minor)


Undergraduate Study

Undergraduate study in this program provides the student with an opportunity to develop a minor or an area of concentration in technology and social change. It involves a balanced grouping of courses in technology, the social sciences, and the humanities with specialized courses in the area, helping the student to develop both a sensitivity to the issues and the ability to synthesize ideas from the variety of disciplines important to the technology and social change process. It also serves as preparation for advanced study in this area. A specific program should be developed for each student, and should involve a member of the technology and social change advisory committee from outside the student's curriculum as well as the student's adviser. The committee maintains a list of recommended courses, revising it annually.

Students pursuing a baccalaureate degree program may elect a minor in technology and social change if the college in which they are enrolled permits declared minors. The minor requirement includes approximately 14 credit hours, including 4 credits of technology and social change courses, to be chosen outside the student's major from a list approved by the technology and social change advisory committee. The courses chosen should complement the major so that a balance of humanities, social sciences, and technology courses is achieved. The minor program is selected in consultation with a member of the technology and social change committee and the student's adviser.

Students enrolled in colleges that do not have declared minors may plan the social science-humanities part of their degree program to achieve a concentration in courses related to technology and social change in consultation with a member of the technology and social change advisory committee and the student's adviser.

Graduate Study

Work is offered for a minor in technology and social change under a cooperative arrangement with the following departments participating in the program: Aerospace Engineering, Agricultural Engineering, Agronomy, Animal Science, Architecture, Chemical Engineering, Chemistry, Civil Engineering, Community and Regional Planning, Computer Science, Earth Sciences, Economics, Electrical Engineering.

Students choosing to declare a minor in technology and social change will: pursue a degree program in the major department. A member of the supervisory committee of the interdepartmental program technology and social change will serve on the committee guiding the student's program of study. This member should be a member of the graduate faculty and should be from a discipline outside the field of the major area of study. He or she is to be chosen by the student in consultation with the chairman of the supervisory committee, and appointed by the dean of the Graduate College.

The committee guiding the program of study of a student declaring a minor in technology and social change will select a group of courses from the list given below. For the master of science degree, this group should be at least 10 credit hours and for the doctor of philosophy degree, the minimum requirement is 15 hours. Of this requirement, 4 hours must be chosen from courses in technology and social change acceptable for graduate credit.

The group of courses selected by the student's committee to form a minor in technology and social change must be chosen from outside the major area of study. They should be designed to broaden the scope of the student's training to include the humanities, the social sciences, and technology. The program for the declared minor will be approved by the technology and social change supervisory committee.

A minor in technology and social change should be selected from the following suggested courses:

- Technology and Social Change: 541, 542, 586F, 640
- Aerospace Engineering: 350, 481, 485, 571, 575
- Agricultural Engineering: 422, 430, 435, 471, 501
- Agronomy
- All courses appearing in graduate catalog are acceptable
- Animal Science: All courses appearing in graduate catalog are acceptable
- Anthropology: 533, 560D, 560E, 560G
- Chemistry: 331, 332, 426, 599
- Community and Regional Planning: 380, 383, 395, 403, 493, 511, 515, 520, 527, 575
- Computer Engineering: 340, 440
- Computer Science: 375, 441
- Economics: 411, 512, 520, 535, 561
- Electrical Engineering: 450, 451, 474, 476
- English: 495, 534
- Family Environment: 391, 510, 519, 521, 522, 575, 604
- Food and Nutrition: 305, 319, 410, 413, 414
- Geography: 495
- Geology: 484
- History: 436, 458, 459, 463, 480, 481, 482, 489, 591C, 592
- Industrial Education: 502, 554, 615, 644, 652, 657
- Industrial Engineering: 404, 424, 425, 475, 504, 506, 515, 527, 552, 624
- Journalism and Mass Communication: 425, 515, 545, 580G, 590I, 590K
- Materials Science and Engineering: All courses appearing in graduate catalog are acceptable
- Meteorology: 406, 531
- Nuclear Engineering: 401, 484, 541, 654
- Philosophy: 380, 431, 480
- Physics: 304, 311, 317T, 350, 361, 364, 365, 447, 511, 524, 528, 531, 571, 572
- Political Science: 443, 444, 447, 448, 481, 543, 547, 549, 574
- Professional Studies in Education: HPC Ed 581, 584, 585, 586, 590
- Textiles and Clothing: 354, 355, 404, 465, 525, 554, 555, 556, 580
- Courses Primarily for Undergraduate Students

341. Technology: International, Social, and Human Problems. (U S 341) (3-0) Cr 3 F An interdisciplinary study of the international significance of technology and the societal and human issues arising from its development and adoption.

441. Seminar in Technology and Social Change: The International Dimension (U S 441) (1-0) Cr 1 each time. Each time elected. S Prereq: 341 International problems involved in the transfer of technology and resultant social change in foreign cultures.

540F. Special Topics: Technology and Social Change. (U S 540F) Cr 1-3 F SS SSS Prereq: 341 Consideration of problems and issues arising from the transfer of technology on a society.

Courses Primarily for Graduate Students, minor only, open to qualified undergraduates.

541. Technology and Social Change in Foreign Cultures. (U S 541) (3-0) Cr 3 S Prereq: Grad or graduate classification. An interdisciplinary study of technology and the effects of technological change within economically less developed countries. Analysis of the role of science and technology in development, implications and consequences of technology transfer, issues and constraints involved in choosing an appropriate technology.

542. World Food Issues. (U S 542) (3-0) Cr 3 S Prereq: 541 or graduate classification. An interdisciplinary study of societal, human and technological aspects of the world food situation. The study examines four issues: the present world food situation, the challenge of meeting future food requirements, constraints to growth and change, and professional, scientific, and technical strategies for dealing with these issues.

590F. Special Topics: Technology and Social Change. (U S 590F) Cr 1-3 F SS SSS Prereq: 541 Individual study on topics involving technology and social change in foreign cultures.

Courses for Graduate Students, minor only

640. Seminar in Technology and Social Change (U S 640) Cr 1-3 each time elected. S SS SSS Prereq: 541 Consideration of problems and issues arising from the effects of technological change in foreign cultures. Issues and problems vary each time offered.

Telecommunicative Arts

For description of courses, see Speech

Textiles and Clothing

Agatha L. Huenneke, Head of Department

Professors: Danielson, Huenneke, Winakor

Professors Emeritus: Hollen, Potgeru, Saddler, Warning

Associate Professors: Farrell, Hall, Kundel

Assistant Professors: Braekelsberg, Kadoch, Kim, Kurz, Langford, Lutrell, Marshall, Polan, Reilly, Seifert, Shibles, Stone, Williams

Instructors: Jezek, Rice

Undergraduate Study

The department offers work for the degree Bachelor of Science with a minor in apparel design and patternmaking, fashion merchandising, and textiles and clothing related science. The latter curriculum has two options: physical science and social science. These curricula prepare graduates for a wide variety of careers in business, industry, and government.

The curriculum in apparel design and patternmaking is planned for those interested in the aesthetic aspects of textiles and clothing and in apparel design. The program in fashion merchandising is planned for students interested in careers in the marketing of textiles and clothing products by retailers and manufacturers, within the framework of sound business management.

The curriculum in textiles and clothing related science is designed for those who wish to prepare for advanced study leading to careers in college teaching or in research. The physical science option prepares the student for research in textiles and forms a foundation for further study. The social science option is designed for the student interested in the economic, anthropological, and psychological aspects of textiles and clothing.

Courses in textiles and clothing provide knowledge applicable to the use of clothing and household fabrics by individuals and families. The scientific and cultural aspects of textiles and clothing are examined, with emphasis on aesthetic, economic, sociological, anthropological, and psychological aspects.

Graduate Study

The department offers the degree Master of Science with a major in textiles and clothing, and a minor to students taking a major work in other departments. The department participates in the interdepartmental minor programs of Gerontology and Technology and Social Change (see Index).

Prerequisite to major graduate work is the completion of selected courses in art and design, the humanities, physical and social sciences, and textiles and clothing. The specific prerequisites will depend upon the nature of the work the student wishes to pursue. A thesis is required.

Open to graduate students for minor credit only: 354, 355, 404, 464, 485, 468.

Courses Primarily for Undergraduate Students

121. Clothing Construction. (1-1) Cr 3 F SS Principles of clothing construction, use of commercial patterns, from a consumer's standpoint, the study of factors influencing quality of custom-made garments and those that are commercially produced.
Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates


504. Textile Science. (3-0) Cr 3 F Prereq. 404 Scientific principles and theories involved in fiber formation, fiber properties, color, finishes, analysis of fabric geometry and deformation

521. Experimental Clothing Construction. (2-3) Cr 3 F Prereq 6 credits in clothing construction/patternmaking Problem solving approach to clothing construction and fitting. Use of different fabrics, time studies and alternative techniques

525. Advanced Patternmaking. (1-5) Cr 3 S Prereq. 345, 6 credits in patternmaking Use of flat pattern and draping techniques for more intricate designs of sleeves, bodices, dresses. Methods of drafting basic pattern blocks and pattern grading procedures. Patternmaking for unified coat or jacket, for men's wear and children's wear

545. Advanced Costume Design. (2-0) Cr 2 S Prereq. 6 credits from 345, 346, 347, 348, 349, 350, 351, 352 Analysis of costume in the light of theories formulated by writers on aesthetics, art history, costume history, and perception

555. History of Textiles II. (2-0) Cr 2 S Prereq. 355 Technical aspects of fabric structure and applied textile design within and across cultures, evolution of classic and individual textile motives, research techniques, individual topics

557. Restoration and Conservation of Textiles. (1-2) Cr 2 Alt F offered 1983, 350 Purpose and function of historic collections, problems in acquisition and cataloging, restoration, and preservation techniques for maintenance, storage, and display of historic textiles and costumes

565. Sociological and Psychological Aspects of Clothing and Textiles II. (2-0) Cr 2 F Prereq. 465 Readings in sociological and psychological literature applicable to clothing and textiles. Written and oral presentations of reading and research. Emphasis on theory

566. Asian Costume and Textiles. (2-0) Cr 2 Alt S offered 1982 Prereq 555, Asian history or Asian art history Group and individual studies of traditional costumes and textiles of selected Asian countries Includes China, Japan, Korea, South Asia, India, Indonesia and selected Middle Eastern countries Topics may vary with semester of offering

567. Ethnic or Regional Costume and Textiles. (2-0) Cr 2 Alt S offered 1983 Prereq 555 Group and individual studies of traditional costumes and textiles of selected folk cultures Includes cultures of Europe, the Americas, Africa, and Oceania Topics may vary with the semester of offering

699. Research
systems, transportation policy analysis, analysis of transportation technologies, commodity distribution, public administration of the transportation planning process, regional development and transportation system interrelationships, transportation economics and finance, and planning for logistics management.

Students majoring in transportation planning will choose a major professor from the graduate faculty, and the major professor from the cooperating department for the graduate student's degree. Transportation students will be the Graduates of the College for administrative purposes. Students will be in the departments of major professors.

A student must complete at least 30 credit hours of acceptable work. At least 20 credits for the thesis option and 24 credits for the non-thesis option shall be selected from a list of courses approved for inclusion in a program in transportation planning. The foreign language requirement, if any, is established on an individual basis by the student's program of study committee.

Courses Primarily for Graduate Students, open only

690 Advanced Topics. Cr. 1 to 2. Creative component for non-thesis Master of Science degree.

691 Seminar in Transportation Planning. (1-2) Cr. 1 each time taken. F S

199 Research

University Studies

George C. Christensen, Vice President for Academic Affairs

Certain interdisciplinary courses are offered through University Studies, at the discretion of the Vice President for Academic Affairs and the University Curriculum Committee. No major is available in University Studies, but credit obtained through University Studies offerings may be applied toward a degree in any of the colleges, consistent with the stipulations of the student's curriculum.

Requests to make use of University Studies 101, 290, 301, and 490 should be directed to the Vice President for Academic Affairs and should be accompanied by a positive recommendation from the department heads and deans of the instructors making the request. The University Curriculum Committee will consider all requests and recommend to the Vice President regarding their disposition after consultation with relevant college and University committees.

Open to graduate students for minor credit only 421, 425

Courses Primarily for Undergraduate Students

101 Interdisciplinary Studies. Cr. var 1. Offered when demand warrants. Experimental interdisciplinary courses offered by an interdepartmental group intended primarily for freshmen and sophomore offerings.

121H, Freshman Honors Seminar. (2-4) Cr. Orientation to Iowa State University and to the University Honors Program. For members of the Freshman Honors Program only.

221 Introduction to Environmental Studies. (Env S 221) (3-0) Cr. F Preq: Sophomore classification. Human population structure and growth, the world food problem, production and consumption patterns in ecosystems and social systems, cultural approaches to the environment, and the growth vs. no growth controversy. Emphasis on factors affecting decision making.

225 Introduction to Environmental Education. (Env S 225) (2-2) Cr. J F Preq: Sophomore classification. Human population structure and growth, the world food problem, production and consumption patterns in ecosystems and social systems, cultural approaches to the environment, and the growth vs. no growth controversy. Emphasis on factors affecting decision making.

311 Seminar in International Studies. (1-3) Cr. 1. Introduction to international studies. Required of all students in the International Studies Program.

321 322 University Honors Seminars. (2-0) Cr. 1 or 2 Yr Preq: Membership in the University Honors Program. Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.


391 Seminar in Environmental Studies. (Env S 391) (1-0) Cr. 1 F Preq: Junior classification. Seminar discussions of various topics of environmental concern.


435 Environment and Society. (Env S 435) (3-0) Cr. J S Preq: 10 hours in social or natural sciences. An in-depth analysis of natural and human-modified ecosystems with an emphasis on energy, resources, food and population as they relate to society and the quality of human environments.

436 Seminar in International Studies. (3-0) Cr. F Preq: Seminar seminar required of majors in international studies. For juniors and seniors only.

437 Foreign Study Cr. var 1 F SS Preq: Permission of chairman of the International Studies Committee. Individual and group study in foreign countries. Intended primarily for juniors and seniors.


University Studies

203

Veterinary Anatomy

J. Canthors, Chair of Department

Professors: J. Canthors, Chovin, Christensen, Dettmann, Ghostal

Emeritus Professor: Magrion

Associate Professors: Adams, Bal, Draper, Uemmri

Instructors: Forsythe, Jacobson

Undergraduate Study

Thorough courses in this department, students acquire a detailed knowledge of the anatomy of domestic animals which is necessary for a proper understanding of physiology, pharmacology, pathology, diagnosis, surgery, and medicine.

For the undergraduate curriculum leading to the degree Doctor of Veterinary Medicine, see Veterinary Medicine, Curriculum

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with a major in veterinary anatomy, and minor work for students majoring in other departments

Cooperative programs between Veterinary Anatomy and the Biomedical Engineering Program are provided jointly under sponsorship
Fundamental knowledge of anatomy, biochemistry, chemistry, mathematics, physiology, and zoology is considered prerequisite for major study in the department. Foreign language requirements may be established by the student’s graduate advisory committee.

### Courses Primarily for Undergraduate Students

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<tr>
<th>Course Code</th>
<th>Prerequisite</th>
<th>Description</th>
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<tbody>
<tr>
<td>302. Morphology of Domestic Animals</td>
<td>3.9 Cr 6 Prereq: Developmental, gross, and microscopic anatomy of ungulates.</td>
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<tr>
<td>303. Applied Anatomy</td>
<td>0.6 Cr 2, S Prereq: Study of anatomy of domestic animals as related to diagnostic, surgical, and radiographic techniques.</td>
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### Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see Veterinary Medicine, Curriculum.

The study of medicine and surgery expands the training previously received in anatomy, physiology, pharmacology, pathology, and microbiology.

The department presents course work in animal reproduction concerning interferences with parturition, diseases of the newborn, and infertility.

The teaching of radiology emphasizes the handling, expose processing, and interpreting of radiographs and the dangers of ionizing radiation to man and animal.

Hospital assignments during the fourth year provide the student an opportunity to participate in the application of clinical skills and knowledge.

### Graduate Study

The department offers work for the degree of master of science in veterinary clinical science, and minor work for students majoring in other departments. Within the veterinary clinical sciences major, the student may specialize in veterinary medicine, surgery, radiology, or theriogenology.

Both thesis and nonthesis options are available.

A satisfactory reading knowledge of one foreign language is strongly recommended. The department uses the standardized examinations provided by the Educational Testing Service for this purpose. However, the department will accept a meaningful collateral work in lieu of a foreign language if this is recommended by the student’s program of study committee.

Prerequisite to major graduate work is graduation from an approved college of veterinary medicine.

Open to graduate students for minor credit only: 443.

### Courses Primarily for Undergraduate Students

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<tr>
<th>Course Code</th>
<th>Prerequisite</th>
<th>Description</th>
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<tbody>
<tr>
<td>391. Radiology</td>
<td>2.0 Cr 1 S S 5 weeks Prereq: Second-year classification in veterinary medicine. Essentials of radiology and radiobiology, includes radiography, fluoroscopy, and clinical and biological uses of x-radiation and radiographs, with special emphasis on protection from radiation and interpretation of radiographs.</td>
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Undergraduate Study
For undergraduate curriculum in veterinary medicine leading to the degree Doctor of Veterinary Medicine, see Veterinary Medicine, Curriculum

The Department of Veterinary Microbiology and Preventive Medicine offers instruction in pathogenic bacteriology and mycology, animal virology, immunology, epidemiology, and public health. Regulatory and preventive veterinary medical aspects of the infectious diseases of animals are emphasized in courses for the student in the veterinary curriculum. Courses designed for students in agriculture deal with the principles of disease prevention in farm animals.

Graduate Study
The department offers opportunities for the degree Master of Science with options in veterinary microbiology and veterinary preventive medicine. The degree Doctor of Philosophy with major in veterinary microbiology can also be earned. Courses are also offered to students doing major work in other departments.

Candidates for departmental majors must possess the O V M degree or an undergraduate degree in biomedical sciences with emphasis in medical microbiology.

The department strongly recommends that applicants take the Graduate Record Examination and use GRE scores as an important element in the selection of graduate students. The program required for the Ph.D. degree must contain a foreign language requirement or a significant cultural component in a collateral field of study. The foreign language option can be satisfied by one year of college level courses in a foreign language (grade A or B) or a passing score on the ETS graduate student foreign language examination, or a test of scientific reading comprehension administered by the department. The alternative cultural component may be in the general areas of language and communication, philosophy and the scientific method, logic, history of science and culture, human values, etc. The foreign language requirement will be specifically determined by the student's program of study committee, with approval of the chair of department. For students whose native language is not English, the ability to communicate adequately (as certified by the Department of English) will be required during the first year of study.

The department also participates in the interdepartmental programs of Immunobiology and Molecular, Cellular and Developmental Biology (See Index)

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

520. Medical Immunology I. (Bact 520) (Imbio 520) 2(2-6) Cr 2 F Prereq. 381 or Micro 300. Kaeberle The immune response, antigens, antibodies, antigen-antibody interactions and other effector mechanisms of resistance to disease.

520L. Medical Immunology Laboratory. (Imbio 520L) 2(2-6) Cr 2 F Prereq. Credit or classification in 520 or Micro 300. Kaeberle Principles of serology and detection of the immune reactivity as applied to diagnosis of disease and research in immunology.

522. Principles of Epidemiology (3-0) Cr 3 F Prereq. 381 or Micro 310. Disease transmission in animal and human populations. Investigation of disease statistics and disease reporting.

524. Veterinary Medical Microbiology. (Micro 524) (2-6) Cr 4. Prereq. 382 or Bot 596. permission of instructor. Gabar. Fungi pathogens for animals and the diseases with which they are associated. Methods of isolation and identification.


599. Special Topics. Cr 1 to 3. Prereq. 382.

Courses for Graduate Students, major or minor

504. Seminar. (1-0) Cr 1 F S Packer.


629. Medical Immunology II. (Imbio 629) (4-0) Cr 4. S Prereq. 520. Gabar. Credit or classification in 520 or Micro 300, permission of instructor. Kaeberle. Role of immunological mechanisms in health and disease. The immunologic system, the immune response, biologic amplification, and factors regulating the system. Advanced study of animal virus-host cell interactions and technical procedures utilized in animal virus research.

631. Veterinary Immunology. (V Ph 631) (Imbio 631) 2(2-6) Cr 2 F Prereq. 520 or Micro 300. Gabar. Basic mechanisms of the immune response in animal disease, the role of immunological mechanisms in health and disease. The immunologic system, the immune response, biologic amplification, and factors regulating the system. Advanced study of animal virus-host cell interactions and technical procedures utilized in animal virus research.

699. Research.
Veterinary Pathology

John P. Kluge, Chair of Department


Emeritus Professors: Lee, Ramsey

Associate Professors: Barnes, Carson, Cassidy, Daniels, Hagemoser, Holter, Larson, McKean, Niyio, O'Toole, Powers, M. G. I. Riley, Stahr

Assistant Professors: C. L. Graham, D. L. Hopper, J. H. Riley

Instructors: Hall, J. G. Hopper, Hyde, Lomax, McAllister, Olson, Schmidt

Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree Doctor of Veterinary Medicine, see Veterinary Medicine, Curriculum.

The Department of Veterinary Pathology offers a systematic study of the dynamics of the disease process. Emphasis is placed on the manner in which disease brings about alterations in the anatomical structure and chemical and physiologic activities of animal cells, tissues, organs, and body systems. The application of these studies forms the basis for more accurate diagnosis which is essential for the treatment and prevention of animal diseases.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with major in veterinary pathology, and minor work for students majoring in other departments. Within the veterinary pathology major the student may specialize in veterinary parasitology or veterinary toxicology.

Prerequisite to major graduate work is the completion of an undergraduate curriculum leading to the degree Doctor of Veterinary Medicine. This requirement may be waived for those individuals wishing to specialize in toxicology or parasitology with the approval of the major professor and the chairman of the department.

The degree Master of Science with thesis requires the completion of a minimum of 30 graduate credits. It is possible to study for the degree Master of Science on a nonthesis basis. This option requires the completion of a minimum of 40 graduate credits, of which at least 10 must be earned in course work outside the department.

The foreign language requirement will be decided by a program of study committee, with the approval of the chairman of the department. For students whose native language is not English, the ability to communicate adequately in English (as certified by the Department of English) will be required.

Minor work is recommended in other departments of the College of Veterinary Medicine or departments or programs in other colleges. The department also participates in the interdepartmental program of Immunobiology (See Index.)

Courses Primarily for Undergraduate Students

371. General and Systemic Pathology. (4-3) Cr 5 F Preq: Second-year classification in veterinary medicine. Basic concepts of cellular and tissue response to disease and tissue reaction to disease in the various body systems.

376. Veterinary Parasitology. (4-3) Cr 5 F Preq: Classification in 371 Parasitic diseases of domestic animals and their control.

422. Special Pathology (3-3) Cr 4 S Preq: 371 Pathogenesis of disease in domestic animals.

428. Clinical Pathology (1-4) Cr 3 F Preq: Principles of clinical hematology and clinical chemistry in domestic animals.

426. Veterinary Toxicology (3-0) Cr 3 S Preq: Third-year classification in veterinary medicine. A study of the disease processes in animals caused by toxicants, and the use of differential diagnostic and therapeutic procedures.

455. Diagnostic Laboratory. Cr 2 each time taken. Preq: Fourth-year classification in veterinary medicine. Practical experience in cases of field cases. Offered on a satisfactory-fail basis only.


490. Independent Study. Cr 3 to 6 S Preq: Permission of instructor and department chairman.

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates.

551. (371) General and Systemic Pathology. (4-3) Cr 5 F Preq: V An 301, 302, or Zo 101, 102. Graduate study in conjunction with 371. Open only to students who do not have, or are not pursuing, the D. V. M. degree. Basic pathology with emphasis on disease in animals.

554. (428) Veterinary Toxicology. (3-0) Cr 3 S Preq: 371. Graduate study in conjunction with 426. Disease processes in animals caused by toxicants, differential diagnostic and therapeutic procedures.

556. Methods in Toxicology. (2-0) Cr 2 F Preq: 10 credits in biology. Permission of instructor. Application and interpretation of toxicology tests for the determination of harmful effects of poisonous substances.

557. (378) Veterinary Parasitology. (5-3) Cr 6 F Preq: 371 or 551. Graduate study offered in conjunction with 378. Open only to students who do not have, or are not pursuing, the D. V. M. degree. Parasitism of veterinary importance, including the disease process and principles of control.


590. Special Topics. Cr 1 to 3 S Preq: Permission of instructor.

A. Veterinary Pathology

B. Veterinary Parasitology

C. Veterinary Toxicology

D. Radiobiology

Courses for Graduate Students, major or minor.

604. Histopathology Seminar. Cr 1 F S S

605. Topica Seminar. Cr 1 F

631. Immunologic Disease. (Immb 631) (V MVP 631) See Veterinary, Microbiology and Preventive Medicine

641. Organic Pesticide Toxicology. (2-0) Cr 2 alt Fall, offered 1983. Preq: 554, permission of instructor. Organic pesticides as related to biologic effects in animals of economic importance, public health hazards, and environmental effects.

642. Toxicology of Heavy Metals and Trace Elements. (2-0) Cr 2 alt Fall, offered 1982. Preq: 554, permission of instructor. Advanced study of heavy metal pollutants and trace elements, their effects in domestic animals, wildlife, and man.

643. Biotoxins. (3-0) Cr 3 Alt Fall, offered 1982. Preq: 554, permission of instructor. Natural toxic background constituents in feeds, toxins present from management practices, pesticides of biological origin, and venom.

644. Feed Additives Toxicology. (2-0) Cr 2 alt Fall, offered 1983. Preq: 554, permission of instructor. Toxicologic effects of feed additives and natural ingredients resulting from mishandling or accident. Federal regulations.

654. Analytical Chemical Toxicology. (1-3) Cr 2 F Preq: Chem 211, 322, permission of instructor. Analysis and interpretation of toxicant residues in animal tissues, feeds, water, soil, and other environmental specimens.

651. Advanced Post Mortem Techniques. (0.3 to 0.9) Cr 1 to 3 F S S. Preq: 376, 422. Staff. Necropsy techniques of animals with emphasis on gross and microscopic lesions and diagnoses.


678. Laboratory Animal Medicine. (V C 678) See Veterinary Clinical Sciences.

679. Research.

A. Veterinary Pathology

B. Veterinary Parasitology

C. Toxicology

Veterinary Physiology and Pharmacology

Donald C. Dyer, Chair of Department

Professors: Ahrens, Allison, Cholvin, Dougherty, Dyer, Engen, Hembrough, Wildhede, Randic, Reece, Swenson, VanMeter, Whipp

Associate Professors: Argenzo, Crump, Draper, Greer, Martin, Pineda

Assistant Professor: Hau

Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree Doctor of Veterinary Medicine, see Veterinary Medicine, Curriculum.
A thorough study of basic physiology is necessary to understand the mechanisms and the treatment of animals diseases. The study of comparative mammalian physiology gives students a background in the functional activities of cells, tissues, organs, and systems with special consideration for the basic physiology of importance to veterinary medicine. An understanding of drug action is essential for rational drug therapy. The general pharmacology courses provide students with a background in basic pharmacology to include pharmacodynamics, toxicology, and the clinical application of drugs. Special emphasis is placed on chemical agents and therapeutic practices specific to veterinary medicine.

Graduate Study

The department offers work for the degrees Master of Science and Doctor of Philosophy with majors in physiology or in physiology with pharmacology as a specialization, and minor work for students majoring in other departments.

Cooperative programs between Veterinary Physiology and Pharmacology and the Biomedical Engineering program are provided jointly under sponsorship of the colleges of Engineering and Veterinary Medicine. See Biomedical Engineering. The department also participates in the interdepartmental program in Molecular, Cellular and Developmental Biology.

Fundamental knowledge of anatomy, biochemistry, mathematics, physiology, and zoology is considered prerequisite for major study in the department.

Foreign language requirements may be established by the student’s graduate advisory committee.

Open to graduate students for minor credit only.

Courses Primarily for Undergraduate Students

229 Physiology of Domestic Animals. (3-0) Cr. 3 F S. Prereq: Biol 101. fundamentals of physiology and their applications to domestic animals.

350 Comparative Veterinary Physiology. (3-0) Cr 3 F. Prereq: First year classification in veterinary medicine. Mammalian, avian, muscular and cardiovascular physiology.

351 Comparative Veterinary Physiology. (5-0) Cr S S. Renal, respiratory, fluid and acid-base balance, endocrine, reproductive and alimentary physiology.

360 General Pharmacology. (4-0) Cr 4 F. Prereq: 351 or 355. General principles, drug disposition, drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems, antimicrobials and antineoplastics.

361 Pharmacology and Therapeutics. (2-0) Cr. 1 S 8 weeks. Prereq: 360. Pharmacology and therapeutic uses of drugs, antiparasitic drugs, and selected drugs in veterinary practice. adverse drug reactions.

365 Physiological Sciences Laboratory. (0-0) Cr. 2 S. Prereq: 360. laboratories designed to illustrate basic principles of the physiology of domestic animals and the pharmacology of selected drugs.

366 Physiological Sciences Laboratory. (0-0) Cr 2 F. Prereq: 365. Laboratories designed to illustrate basic principles of the physiology of domestic animals and the pharmacology of selected drugs.

480 Independent Study. Cr 1-5 each time taken. Prereq: Permission of instructor. Honors.

501, 502. Selected Research Methods in Pharmacology. (0-0) Cr 3 each. 501,F; 502,S. Prereq: Graduate classification. Investigation of pharmacology staff experience in pharmacological techniques in selected pharmacology laboratories: cytotoxicity, microdissection, and intracellular unit recording, microphoresis, spectrophoto-fluorometric analyses of biogenic amines, atomic absorption spectrometry, radiocommunoeasy, gas chromatography, enzyme analysis, use of isolopes in drug studies, intestinal perfusion techniques, renal clearance methods, and isolated tissue bioassays.

531, 533. Physiology and Pharmacology of Synaptic Transmission. (4-0) Cr 2 Alt S. offered 1982. Prereq: 551, permission of instructor. Frank and Vanmeter. anatomical distribution, actions, biochemical aspects of synthesis and degradation, release of possible transmitter substances in mammalian central nervous system. Several amine acids, acetylcholine, catecholamines, 5-hydroxytryptamine, and some peptides of interest in neurobiology. Various drugs will be introduced where their action is related to the subject under discussion.

533 Physiology and Endocrinology of Animal Reproduction. (An S 333) (3-0) Cr. 3 S. Prereq: General pharmacology course. Development of structure and function of the reproductive system. Physiologic and endocrine aspects include puberty, gametogenesis, estrous cycle, pregnancy, parturition, and the interplay of development, thyroid and adrenal functions, and nutrition with these processes.

551, 552. Advanced Vertebrate Physiology. (B M E 551, 552) (Zool 551, 552) (4-3) Cr 5 each. 551 F, 552 S. Prereq: B M E 509 or Zool 300 and Zool 455. 450L, credit or classification in B S 404 or 400. Primarily mammalian physiology. 551 Neurophysiology, mammalian endocrine, endocrine, muscle, temperature regulation. 552 Body fluids, respiratory, renal, cardiovascular, digestion, metabolism.


590 Special Topics. Cr 1 to 7. Prereq. Permission of Instructor.

A. Physiology

B. Pharmacology

Courses for Graduate Students, major or minor


631. Experimental Techniques in Physiology. (2-0) Cr. 4 Alt S. offered 1983. Prereq: 552, 555. Hembrough, staff. Possession of surgical skills required. Basic physiology in animals utilizing various techniques such as fistulas, bypasses, blood flow determinations, and others.


667. Qualitative Pharmacology: Isolated Tissues. (0-8) Cr. 4 S. Prereq: 350 or 560. Permission of instructor. Vanmeter. Laboratory experiments using a variety of isolated smooth muscle, cardiac, and nerve-muscle preparations to study qualitative drug responses. Emphasis on technique and reporting of laboratory data.


690. Advanced Topics. Cr 1 to 5. Prereq. Permission of instructor.

A. Physiology

B. Pharmacology

Water Resources

Water Resources (Interdepartmental Major)

Mervin D. Dougall, Chair, Supervisory Committee


Work is offered for the degrees Master of Science (thesis and nonthesis options) and Doctor of Philosophy with major in water resources under a cooperative arrangement with various departments including Agricultural Engineering, Agronomy, Animal Ecology, Bacteriology, Botany, Chemical Engineering, Civil Engineering, Earth Sciences, Economics, Family Environment, Food and Nutrition, Food Technology, Forestry, Horticulture, Industrial Engineering, Nuclear Engineering, Political Science, and Sociology. Minor work is offered to students taking major work in other areas. Facilities exist in several departments for fundamental research in such areas as source, distribution, and movement of water, hydrology, and hydraulics of water control facilities (water quantity), physical, biological, and chemical properties of water (water quality), and social, legal, and economic aspects of water resource development (water resources economics and institutions).

Students mapping in water resources will choose a major professor from the graduate faculty membership of the cooperating departments and will develop the program of study under the guidance of a committee nominated by the administrative department head, approved by the departmental water resources supervisory committee representative, and appointed by the dean of the Graduate College. For administrative purposes, students will be in the department of their major professor.

For the degrees Master of Science and Doctor of Philosophy, the foreign language requirement, if any, is established on an individual basis by the student's program of study committee. For the nonthesis Master of Science degree, the student must complete at least 50 credit hours of acceptable work, including a WR 580 creative component acceptable to the student's program of study committee.

Water Resources Interdisciplinary Courses

The interdisciplinary, interdepartmental water resources educational program consists of the three-semester sequence in water resources relating to (1) water quantity, (2) water quality, and (3) water resources economics and institutions. In addition, a special topics category and a water resources seminar category are offered. The Water Resources Interdepartmental Supervisory Committee encourages appropriate use of the water resources seminar, and will make it available if possible both spring and fall semester. Appropriate interdisciplinary field trips to resource locations in Iowa and the Midwest are encouraged, particularly during the summer sessions.
Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

577. Water Resources I (C E 577) 3-0 Cr. 3 F
Precursory to the Water Resources Supervisory Committee. Introduction to water resources planning, Hydrology, including source, distribution and measurement of water, water management categories and beneficial use groups, demand for water, hydraulics and water control facilities. Administered by Civil Engineering Cooperative with Agriculture Engineering, Agronomy, and Earth Sciences

578. Water Resources II. (C E 578) 3-0 Cr. 3 S
Precursory to the Water Resources Supervisory Committee. Water resources planning. The role of quality in water resources physical, chemical, and biological aspects of water and waste water. Administered by Civil Engineering Cooperative with Animal Ecology, Botany, and Food Technology

579. Water Resources III. (Econ 579) 3-0 Cr. 3 S
Precursory to the Water Resources Supervisory Committee. Water resources planning. Water management categories and beneficial use groups, water demands for various uses Legal, economic, sociological, governmental and technical aspects of water resources planning and management. Emphasis on systems of rational allocation among competing demands for water. Administered by Economics, cooperatives with Sociology, Political Science, and other cooperating departments

590. Special Topics. Cr. Var. Prereq. Permission of major professor in cooperating department. Literature reviews and current research in accordance with needs and interest of the student. Creative component for nonthesis master of science degree

690. Seminar in Water Resources Management. 1-0 Cr. 1 F S
Precursory to the Water Resources Supervisory Committee, major professor

Women's Studies

Program Committee: Linda R Gaiyi, Chair, R W Bernard, G M Ebert, B A Glatt, K K Heckok, M Y Lee, J S Rasmussen, two student members

Women's Studies is a cross-disciplinary program in the College of Sciences and Humanities in which students may elect a minor area of study or a concentrated area of study under distributed studies. The program consists of core courses from the disciplines of economics, English, history, physical education, political science, psychology, sociology, and women's studies.

Women's studies provides an opportunity for students to investigate women's roles, contributions, and status in a social and cultural context that embraces a variety of disciplines.

Core courses in women's studies are listed below. For information on supporting courses, contact the chairperson of the program committee or the cross-disciplinary office. Any student interested in a minor in women's studies should contact the chairperson of the program committee for advising

201. Introduction to Women's Studies. 3-0 Cr. 3 F
The status of women today from a social, economic, historical, political, philosophical and literary perspective. Background for the other core courses in the program

327. Sex Roles in Modern Society. (Soc 327) See Sociology

345. Literature by or About Women. (Eng 345) See English

346. Psychology of Women. (Psych 346) See Psychology

385. Women in Politics. (Pol S 385) See Political Science

386. History of Women in America. (Hist 386) See History

446. Economics of Discrimination. (Econ 446) See Economics

490. Independent Study. Prereq. Any two core courses in Women's Studies, permission of student together with whom student proposes to work. A study proposal must be submitted to the program committee in advance. See Index. Cross-Disiplinary Programs

523. Sex Roles and Sport. (P E 523) See Physical Education

Zoology

John B Balinsky, Chair of Department

Professors: Balinsky, Bishop, Brown, Buttry, Dolphin, Dunham, Jeska, Mulchmor, Redmond, Ulmer

Emeritus Professors: Harding, Haupt, Hicks, Tauber

Associate Professors: Baker, Drewes, Ellis, Emery, Hoffman, Mayfield, Mitchell, Powell, Shaw, Viles

Assistant Professors: Blaustein, Carlson, Faron, Fassal, Halberg, Shen

Undergraduate Study

For undergraduate curricula in sciences and humanities, with major in zoology, see Sciences and Humanities, Curriculum

In addition to basic degree requirements listed in the Sciences and Humanities, Curriculum, zoology majors (including those preparing for professional programs in medical and other health-related areas) must complete satisfactorily the following requirements

1. Biol 110
2. Zool 206, 206L, 325 and 355
3. 4 credits for three courses numbered 300 level or above which must include at least 7 credits at the 400 level or above, and three zoology courses with laboratories in addition to Bio 110L, Zool 206L, and Zool 355
4. 1 year of introductory chemistry and 1 semester of organic chemistry
5. 1 semester of biochemistry
6. 6 credits of mathematics chosen from the following areas: calculus, statistics or computer science
7. 1 year of general college physics
8. 1 year of one foreign language in college or 2 years of one foreign language in high school
9. English proficiency represented by a grade of C or better in elementary English composition

One or more courses in botany, microbiology, or both, are highly recommended

The flexibility of the requirements for the B S in zoology allows and encourages students interested in majoring in zoology to specialize in one of several areas of zoology

Specific entrance requirements for medical and health-related professions are established by the professional schools. Students interested in fulfilling preprofessional requirements for such professions as cytotechnology, dental hygiene, dentistry, human medicine, medical technology, nursing, optometry, pharmacy, physical therapy, physician's assistant, and veterinary medicine can major in zoology while fulfilling the preprofessional requirements. (See Preprofessional Study)

Training in zoology may lead to employment in teaching, research, conservation, extension service, industrial and hospital laboratory work, technical writing or illustration, and as practitioners in medicine and other health-related professions. Zoology majors interested in research or college level teaching must plan on continuing their education in graduate school

Majors are encouraged to take advantage of the special opportunities available in zoology: The Iowa Lakeside Laboratory at Lake Okoboji and at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi. Interested students should consult their advisers

Graduate Study

The department offers work for the degrees of Bachelor of Science and Master of Science with majors in zoology, or molecular, cellular, and developmental biology. Both degrees require the completion of original research and written thesis or dissertation. A student majoring in zoology may specialize in animal behavior, cell biology, molecular biology, developmental biology, comparative physiology, ecology, endocrinology, immunobiology, neurobiology, parasitology, physiology. In addition to the major in Molecular, Cellular, and Developmental Biology, the department also participates in the interdisciplinary program in Immunobiology (See Index)

Students entering the graduate program in the department must be committed to research and need a sound background in the biological, physical, and mathematical sciences.

Applicants are required to submit Graduate Record Examination (GRE) scores for both the aptitude and the biology advanced area tests

Specific course requirements for advanced degrees depend largely upon previous training and experience in the major area of specialization. There is no foreign language requirement for the M S degree. Proficiency in one foreign language is required for the Ph D degree. The student's committee may require additional language competence. Certification in the use of written English is also required. All graduate students must acquire teaching experience in laboratory courses as part of their graduate program

During the summer certain graduate courses in zoology are taught, and special research projects are supervised at the Iowa Lakeside Laboratory, Lake Okoboji.

Open to graduate students for minor credit only 428, 434, 434L

Courses Primarily for Undergraduate Students

100. Opportunities in Zoology. (1-0) Cr. 1 F Orientation to the area of zoology. Specializations and career opportunities in the zoological sciences, including medically related professions. Offered on a satisfactory-fail basis only

155. Basic Human Physiology and Anatomy. (3-0) Cr. 3 F S S S. Prereq. Biology I and chemistry or Biol 109 or Biol 110, Biol 109 or 110. Recommended for those interested in the structure and functions of human organ systems

156. Laboratory in Human Physiology and Anatomy. (0-4) Cr. 2 F S S S. Prereq. Credit or classification in 155. Introduction to selected aspects of human anatomy and physiology through the use of models, specimens, and student conducted experiments

206. General Zoology. (3-0) Cr. 3 F S S S. Prereq. Biol 110. Phylogeny, anatomy, physiology, and early development of animals

206L. General Zoology Laboratory. (0-4) Cr. 2 F S S S. Prereq. Credit or classification in 206L. Detailed anatocial and morphological analysis of selected vertebrates and invertebrates, introductory classification, and life histories

258. Human Reproduction. (3-0) Cr. 3 F Prereq. 155 or Biol 109 or Biol 110 Anatomy and physiology of human
reproductive systems, including fertility, pregnancy, and delivery.

305. Evolutionary Biology. (Biol 303) Cr. 3 See Biology.

306. Animal Behavior. (3 or (3-3) Cr. 3 or (3-3) Cr. 4 F Prereq. 305. Comparative, communicative, social, genetic, developmental, ecological, and evolutionary aspects of behavior. Laboratory techniques for observation, development and analysis of animal activities; independent projects.

311. Introduction to Parasitology. (Micro 311) (3-3) Cr. 4 F Prereq. 206L. Biology and host- parasite relationships of major groups of animals, and techniques of dealing with parasitic problems.

320. Comparative Chordate Anatomy. (2-4) Cr. 4 F Prereq. 206L. Selected choroid arems with emphasis on adaptation and evolution.

322. Vertebrate Histology. (2-4) Cr. 4 S Prereq. 206L, 320. Recommended. Selected vertebrate tissues studied microscopically.

325. Cellular Physiology. (3-0) Cr. 3 F Prereq. 206 or Biol 110. Principles of cell structure and function.

355. Principles of Physiology. (3-0) Cr. 3. F. S.S.S. Prereq. 206, 206L, and either 325 or organic chemistry. Introduction to systemic functions with emphasis on vertebrates.

357. Physiology of Human Reproduction. (2-0) Cr. 2. S. Prereq. 256, permission of instructor. Study and discussion of current research in human reproductive physiology.

358. Advanced Invertebrate Zoology. (3-0) Cr. 3 or (3-6) Cr. 4 F. Prereq. 206, 206L, 325 or 355. Permission of instructor to enroll in lab. In-depth study of selected invertebrate groups, analysis of current research topics.

450. Cellular Physiology Laboratory. (3-0) Cr. 1. F Prereq. 355. Observations and experiments on developmental aspects of selected organisms.

450L. Cellular Physiology Laboratory. (1-0) Cr. 1. Alt S. Prereq. 355 and one of the following: 206L, 206 or 355. Emphasis on biochemical methods and electron microscopy.

454. General and Comparative Endocrinology. (3-0) Cr. 3 or (3-3) Cr. 4 F. Prereq. 355 or 358. Chemical integration of vertebrate organs. The structure, development, and evolution of the nervous system and the gonads and the function and structure of their hormones. Laboratory techniques for studying hormonal phenomena.

460. Introduction to Neurobiology. (3-0) Cr. 3 or (3-3) Cr. 1 or 3 F. Prereq. 355 or 358. Techniques, including microelectrode methods in cellular and molecular neurobiology. Laboratory projects. Emphasis on morphology, membrane and organelle function, transport, and regulation.

456. General and Comparative Endocrinology Laboratory. (0-2) or (4-2) cr. 2 or 4 F. Prereq. 355 and permission of instructor. Laboratory techniques in cellular and molecular endocrinology. Laboratory projects. Emphasis on hormonal and endocrine systems.

450L. Cellular Physiology Laboratory. (1-0) Cr. 1. Alt S. Prereq. 355 and one of the following: 206L, 206 or 355. Emphasis on biochemical methods and electron microscopy.

454. General and Comparative Endocrinology. (3-0) Cr. 3 or (3-3) Cr. 4 F. Prereq. 355 or 358. Chemical integration of vertebrate organs. The structure, development, and evolution of the nervous system and the gonads and the function and structure of their hormones. Laboratory techniques for studying hormonal phenomena.

460. Introduction to Neurobiology. (3-0) Cr. 3 or (3-3) Cr. 1 or 3 F. Prereq. 355 or 358. Techniques, including microelectrode methods in cellular and molecular neurobiology. Laboratory projects. Emphasis on morphology, membrane and organelle function, transport, and regulation.

456. General and Comparative Endocrinology Laboratory. (0-2) or (4-2)Cr. 2 or 4 F. Prereq. 355 and permission of instructor. Laboratory techniques in cellular and molecular endocrinology. Laboratory projects. Emphasis on hormonal and endocrine systems.


528. Cellular Growth and Regulation. (3-0) Cr. 3 F. Prereq. Courses in cell biology and biochemistry. Cell cycle, regulation of cell growth, cell division, membranes, transport processes, and regulation of cellular activities.

534. Molecular Development and Differentiation. (3-0) Cr. 3 S. Prereq. Courses in development and cell biology. Molecular basis of eukaryotic cells emphasizing developmental events.


551. Advanced Vertebrate Physiology I. (3-0) Cr. 5 F. Prereq. 355, 320 or B M E 525, credit or classification in B B 420 or 420. Neurophysiology, sensory systems, muscle, neuroendocrinology, endocrinology.

552. Advanced Vertebrate Physiology II. (4-3) Cr. 5 S. Prereq. 355, 320 or B M E 525, credit or classification in B B 420 or 420. Cardiovascular, renal, respiratory physiology, and digestion.

554. (454 DL) General and Comparative Endocrinology. (3-0) Cr. 3 or (3-3) Cr. 4 Alt S. Prereq. 1983. Emphasis on the chemical integration of endocrine systems and the function and structure of the hypothalamic-pituitary-gonadal axis. Laboratory techniques for studying hormonal phenomena.

556. (456 DL) Introduction to Neurobiology. (3-0) Cr. 3 or (3-3) Cr. 4 Alt S. Prereq. 355 or Psych 311. Physics and physiology of nervous systems. Techniques of experimental manipulation in lab. Graduate study in conjunction with 456. Integration, coding, plasticity, and development in nervous systems.

559. (459 DL) Environmental Physiology. (3-0) Cr. 3 or (3-3) Cr. 4 Alt S. Prereq. 355. Topics in experimental manipulation in lab. Graduate study in conjunction with 459. Physiological adaptations to the environment with emphasis on vertebrates.

650. Immunopathology. (V. Ph 560) See Veterinary Pathology.

590. Special Topics. Cr. 1 to 5 each time taken. Prereq. Permission of instructor.

Courses for Graduate Students, major or minor

610. Current Topics in Parasite Ultrastructure and Physiology. (3-0) Cr. 3 or (3-3) Cr. 1 or 3. Prereq. 355 or Paris 311, physics recommended. Permission of instructor to enroll in lab. Integration, coding, plasticity, and development in nervous systems.

610. Current Topics in Parasite Ultrastructure and Physiology. (3-0) Cr. 3 or (3-3) Cr. 1 or 3. Prereq. 355 or Paris 311, physics recommended. Permission of instructor to enroll in lab. Integration, coding, plasticity, and development in nervous systems.

611. Current Topics in the Cellular and Molecular Biology of Animal Systems. (2-0) 1 to 3 cr. 1 each time taken. Prereq. 528. Topics in cell organel function, cellular interactions, and eukaryotic molecular biology.

653. Advanced Developmental Biology. (3-0) Cr. 3 each time taken. Prereq. 355, permission of instructor. Critical analysis of current literature in the field of developmental biology.

656. Cell Culture. (2-0) Cr. 2 each time taken. Prereq. 355, 320 or B M E 525, credit or classification in B B 420 or 420. Neurophysiology, sensory systems, muscle, neuroendocrinology, endocrinology.


660. Current Topics in Neurobiology and Behavior. 2-3 cr. each time taken. Prereq. Permission of instructor. Topics may include communication, hormones and behavior, neural integration, neuroanatomy and histology, sensory biology, social behavior, techniques in neurobiology and behavior.

670. Seminar in Zoology. Cr. 1 each time offered. On a satisfactory-fail basis only. Open to Graduate students in zoology.


678. Seminar in Molecular, Cellular, and Developmental Biology. (3-0) Cr. 4 Open to graduate students in molecular, cellular, and developmental biology.

690. Research

"Courses Offered at the Iowa Lakeside Laboratory"
The Faculty

The General Faculty consists of the President, Vice Presidents, Deans, all persons with regular or adjunct academic rank, and such other members of the University Staff as the President may designate. The Dean of Admissions and Records serves as secretary.


ABATZIOULOU, THEOGEORGES, Assistant Professor of Mathematics. B.S., 1971, California Institute of Technology; Ph.D., 1976, California (Irvine); 1976, 1978.*


ABOUL-GAVAL, MOUSTAFA, Associate Professor of Veterinary Microbiology and Preventive Medicine. 8 V. Sc., 1962, Cairo (Egypt); M.D. Vet., 1970, Hannover (West Germany). 1971.

ABRAHAM, WILLIAM H., Professor of Chemical Engineering. B.Ch.E., 1952, Cornell; Ph.D., 1957, Purdue. 1952.

ABRAMS, MICHAEL, Assistant Professor of Economics. B.A., 1973, California (Santa Barbara); M.A., 1975, California (Los Angeles). 1990.


BUNDY, BUNDY, Professor of Agricultural and Biological Engineering. B.S., 1958, Iowa State; M.S., 1962, Iowa State; Ph.D., 1966, Iowa State. 1962, 1966.
CAMP, CAMP, Assistant Professor of Agricultural and Biological Engineering. B.S., 1965, Oklahoma State; M.S., 1967, Oklahoma State. 1966, 1970.
CAMPBELL, CAMPBELL, Associate Professor Emeritus of Veterinary Science. B.S., 1944, Kansas State; M.S., 1946, Kansas State; Ph.D., 1949, Iowa State. 1946, 1957.
CARLIN, CARLIN, Professor Emeritus of Food and Nutritional Science. B.S., 1931, M.A., 1933, Columbus, M.S., 1941, Columbus. 1933, 1943.
HENNESS, PAUL
Development. B.A., 1948, Island;
EPS, Psychology. B.S., 1965, M.S., 1966,
Art 1958, Columbia.
FALK, EWING, SOLON A., Drexel;
FINLEY, DORANN K., Professor of Physics. B.S., 1956, Pennsylvania State; Ph.D., 1962, Illinois.
FISHER, ROBERT W., Associate Professor of Mechanical Engineering. B.S., 1949, Iowa State, 1957, 1962.
FLATT, RONALD E., Professor of Veterinary Pathology, Seed and Weed Sciences and Chair of the Department. B.S., 1962, Iowa State, 1965.
FORD, ARTHUR, Professor of Library. B.A., 1928, Iowa State; M.A., 1931, Michigan, 1936.
LEWIS, DONALD R., Assistant Professor of Entomology, A.B., 1971, Wilmington; M.S., 1973, Ph.D., 1978, Ohio State.

LEWIS, EDMUND C., Professor of Psychology; Associate Vice President for Academic Affairs. B.A., 1954, Buffalo; M.A., 1955, Ph.D., 1957, Ohio State. 1957, 1962.


PEASE DAMARIS, Professor of Child Development; Mary W. Eldred Professor in Home Economics, B.S., 1944, M.S., 1946, Ohio State; Ph.D., 1953, Cornell, 1953, 1963.


PETERSON, ROBERT M., Professor of Aerospace Engineering; Associate Dean of the College of Engineering, B.S., 1946, M.S., 1948, Ph.D., 1957, Iowa State.

PETERSON, PETER A., Professor of Agronomy; Professor of Genetics. B.S., 1947, Ph.D., 1950, Illinois, 1953.


PHIPPS, KELLY, Adjunct Instructor in Physical Education; Women's Softball Coach. B.A., 1979, Kansas.


PIERRE, WILLIAM H., Emeritus Professor of Agronomy, B.S., 1921, M.S., 1923, Ph.D., 1925, Wisconsin, 1921.


RUSSEL, W., Associate Professor of Animal Science. Professor of Food Technology. B.S., 1951, Wisconsin. 1953, 1979.


SAGE, CHARLES R., Associate Professor of Library. B.S., 1959, Iowa State; M.S., 1967, Iowa State. 1967.


SAND ISON, DONALD E., Professor of Mathematics. B.A., 1949, Cornell College; M.S., 1951, California Institute of Technology; Ph.D., 1953, University of Wisconsin. 1953.


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Larry D Dale
David D Donne
Roger A Hansen.
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# Summary of Enrollment

**1978-1979** A summary of different individuals enrolled during the year

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Fiscal Year</th>
</tr>
</thead>
</table>

## Grand Total of all students

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16,168</td>
<td>10,574</td>
<td>26,742</td>
<td>17,011</td>
<td>11,443</td>
<td>28,454</td>
<td></td>
</tr>
</tbody>
</table>

## Total of all students of college grade

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16,132</td>
<td>10,480</td>
<td>26,612</td>
<td>16,958</td>
<td>11,319</td>
<td>28,277</td>
<td></td>
</tr>
</tbody>
</table>

## I. Students in residence of college grade

| College of Agriculture | 3,181 | 730 | 3,911 | 3,245 | 751 | 3,996 |
| College of Design | 853 | 781 | 1,634 | 853 | 781 | 1,634 |
| College of Education | 490 | 853 | 1,343 | 523 | 929 | 1,452 |
| College of Engineering | 3,812 | 341 | 4,153 | 3,922 | 351 | 4,273 |
| College of Home Economics | 85 | 1,908 | 1,993 | 96 | 2,037 | 2,133 |
| College of Sciences and Humanities | 4,262 | 3,640 | 7,922 | 4,492 | 3,828 | 8,320 |
| College of Veterinary Medicine | 325 | 117 | 442 | 325 | 117 | 442 |
| Graduate College | 2,567 | 1,121 | 3,688 | 2,928 | 1,435 | 4,363 |

## Total

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15,595</td>
<td>9,491</td>
<td>25,086</td>
<td>16,384</td>
<td>10,229</td>
<td>26,613</td>
<td></td>
</tr>
</tbody>
</table>

### Duplicates

<table>
<thead>
<tr>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>159</td>
<td>4</td>
<td>163</td>
<td></td>
<td>160</td>
<td>4</td>
<td>164</td>
</tr>
</tbody>
</table>

## II. Students not in residence of college grade: extension, off-campus and UMA

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>696</td>
<td>993</td>
<td>1,689</td>
<td>734</td>
<td>1,094</td>
<td>1,828</td>
<td></td>
</tr>
</tbody>
</table>

## III. Students in residence not of college grade: music, nursery school and safety education

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36</td>
<td>94</td>
<td>130</td>
<td>53</td>
<td>124</td>
<td>177</td>
<td></td>
</tr>
</tbody>
</table>

**1979-1980** A summary of different individuals enrolled during the year

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Fiscal Year</th>
</tr>
</thead>
</table>

## Grand Total of all students

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16,308</td>
<td>10,724</td>
<td>27,032</td>
<td>17,149</td>
<td>11,492</td>
<td>28,641</td>
<td></td>
</tr>
</tbody>
</table>

## Total of all students of college grade

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16,263</td>
<td>10,660</td>
<td>26,923</td>
<td>17,085</td>
<td>11,394</td>
<td>28,479</td>
<td></td>
</tr>
</tbody>
</table>

## I. Students in residence of college grade

| College of Agriculture | 3,051 | 752 | 3,803 | 3,130 | 772 | 3,902 |
| College of Design | 1,020 | 1,012 | 2,032 | 1,052 | 1,047 | 2,099 |
| College of Education | 476 | 865 | 1,341 | 518 | 921 | 1,439 |
| College of Engineering | 3,884 | 415 | 4,299 | 3,981 | 425 | 4,406 |
| College of Home Economics | 52 | 1,563 | 1,615 | 55 | 1,630 | 1,685 |
| College of Sciences and Humanities | 4,399 | 3,873 | 8,272 | 4,603 | 4,076 | 8,679 |
| College of Veterinary Medicine | 334 | 147 | 481 | 334 | 147 | 481 |
| Graduate College | 2,368 | 1,218 | 3,587 | 2,718 | 1,530 | 4,248 |

## Total

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15,586</td>
<td>9,845</td>
<td>25,430</td>
<td>16,391</td>
<td>10,548</td>
<td>26,939</td>
<td></td>
</tr>
</tbody>
</table>

### Duplicates

<table>
<thead>
<tr>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>7</td>
<td>162</td>
<td></td>
<td>160</td>
<td>7</td>
<td>167</td>
</tr>
</tbody>
</table>

## II. Students not in residence of college grade: extension, off-campus and UMA

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>833</td>
<td>822</td>
<td>1,655</td>
<td>854</td>
<td>853</td>
<td>1,707</td>
<td></td>
</tr>
</tbody>
</table>

## III. Students in residence not of college grade: music, nursery school and safety education

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45</td>
<td>64</td>
<td>109</td>
<td>64</td>
<td>98</td>
<td>162</td>
<td></td>
</tr>
</tbody>
</table>

---

*Data based on curriculum at time of first enrollment for the year*
**Data based on status at time of first enrollment for the year*
## Degrees Awarded

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Baccalaureate Degrees (Total)</td>
<td>3,484</td>
<td>3,617</td>
<td>92,170</td>
</tr>
<tr>
<td>Doctor of Veterinary Medicine (Total)</td>
<td>88</td>
<td>122</td>
<td>3,672</td>
</tr>
<tr>
<td>Higher Degrees (Total)</td>
<td>866</td>
<td>818</td>
<td>23,071</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>227</td>
<td>239</td>
<td>6,969</td>
</tr>
<tr>
<td>Master of Architecture</td>
<td>9</td>
<td>12</td>
<td>84</td>
</tr>
<tr>
<td>Master of Arts</td>
<td>33</td>
<td>33</td>
<td>310</td>
</tr>
<tr>
<td>Master of Community and Regional Planning</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Master of Domestic Economy (Discontinued)</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Master of Education</td>
<td>0</td>
<td>0</td>
<td>141</td>
</tr>
<tr>
<td>Master of Engineering</td>
<td>16</td>
<td>14</td>
<td>337</td>
</tr>
<tr>
<td>Master of Forestry (Discontinued)</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Master of Landscape Architecture</td>
<td>5</td>
<td>4</td>
<td>70</td>
</tr>
<tr>
<td>Master of Philosophy (Discontinued)</td>
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<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Master of Public Administration</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Master of Science</td>
<td>570</td>
<td>502</td>
<td>14,662</td>
</tr>
<tr>
<td>Specialist</td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Professional Degrees (Discontinued)</td>
<td>-</td>
<td>-</td>
<td>354</td>
</tr>
<tr>
<td>In Engineering</td>
<td>-</td>
<td>-</td>
<td>58</td>
</tr>
<tr>
<td>Master of Agriculture</td>
<td>-</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Master of Forestry</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Master of Landscape Architecture</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Honorary Degrees</td>
<td>-</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Doctor of Agriculture</td>
<td>-</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Doctor of Engineering</td>
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<td>-</td>
<td>51</td>
</tr>
<tr>
<td>Doctor of Laws</td>
<td>-</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Doctor of Science</td>
<td>-</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Master of Philosophy</td>
<td>-</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Master of Science</td>
<td>-</td>
<td>-</td>
<td>337</td>
</tr>
<tr>
<td>All Degrees Conferred</td>
<td>4,438</td>
<td>4,557</td>
<td>118,913</td>
</tr>
</tbody>
</table>
29. Academic Regulations
27. Accounting, Major
24. Accreditation, University
21. Administration of Iowa State University
18. Admissions and Records
15. Admission Requirements
12. Graduate College
9. Teacher Education Program
6. Transfer Students
3. Veterinary Medicine
2. Adult and Extension Education, Courses
1. Adult Home Economics Education, Curriculum
0. Advertising/See Journalism and Mass Communication
39. Advertising Design, Curriculum
38. Advisory Committee, M. S. and M. A. Ph D
37. Aerospace Engineering, Courses and Programs
36. Curriculum
35. Affirmative Action Policy
34. Agricultural Biochemistry, Curriculum
33. Agricultural Business, Curriculum
32. See also Economcs, Courses and Programs
31. Agricultural Climatology, Major
28. Agricultural Education, Courses and Programs
27. Curriculum
26. Agricultural Engineering, Courses and Programs
25. Curriculum
24. Agricultural Extension Education, Curriculum
23. See also Journalism and Mass Communication
22. Agricultural Mechanization, Courses
21. See also Agricultural Engineering
20. Agricultural Studies, Courses
19. Agriculture and Home Economics Experiment Station
18. Agriculture, College of
17. Advising System
16. Curriculum
15. Departments
14. Group Requirements
13. High School Preparation
12. Program Development
11. Program in Preentary Medicine
10. Scholarships
9. Training for Extension Service
8. Agronomy, Courses
7. Curriculum
6. Air Force Aerospace Studies, Courses
5. See also Officer Education Programs
4. American Indian Studies, Courses
3. American Government, Teaching Specialization
2. Ames Laboratory of the U.S. Department of Energy
1. Animal Breeding, Major
0. Animal Ecology, Courses
33. Curriculum
2. Animal Nutrition, Major
1. Animal Science, Courses
33. Curriculum
2. Anthropology, Courses/See also Sociology and Anthropology
1. Apparel Design and Patternmaking, Curriculum
11. Application Fee
8. Archaeology
8. Architecture, Courses
39. Curriculum
38. Bachelor of Architecture Programs
37. Bachelor of Arts Programs
36. Master of Architecture Programs
7. Areas of Specialization, Graduate College
7. Definition of Teacher Education
90. Art and Design, Courses
39. Curriculum
55. Art and Home Economics
39. Art Education, Curriculum/See also Art and Design
175. Astronomy and Astrophysics, Courses/See also Physics
171. Athletics/See also Physical Education
23. Automobiles
28. Bachelor of Liberal Studies
26. Bachelor's Degree Requirements
19. Baccalaureate Grant
23. Bicycle Regulations
92. Biochemistry and Biophysics, Courses/See also Sciences and Humanities Curriculum
93. Biology, Courses
189. Cross-Disciplinary Program
190. Teaching Specialization
See also Sciences and Humanities, Curriculum
94. Biomedical Engineering, Courses
33. Biometry, Curriculum/See also Statistics
24. Biophysics/See Biochemistry and Biophysics
5. Board of Regents
95. Botany, Courses/See also Sciences and Humanities, Curriculum and Plant Pathology, Seed and Weed Sciences
96. Business/See Agricultural Business
66. Business Administration, School of Curriculum
66. Business Communication/See English Journalism and Mass Communication and Speech
2. Calendar
191. Campus Map
2. Career Planning, Courses
2. Cars
26. Catalog in Effect
10. Cell Biology/See Molecular Cellular and Developmental Biology
23. Center for Agricultural and Rural Development
24. Center for Industrial Research and Service (CIRAS)
49. Ceramic Engineering, Curriculum/See also Materials Science and Engineering
99. Chemical Engineering, Courses
50. Chemistry, Courses
100. Teaching Specialization/See also Sciences and Humanities, Curriculum
190. Child Care
23. Child Development, Courses/See also Preschool-Kindergarten
certification Handicapped Preschool Children
56. Child, Parent, and Community Services, Curriculum
105. Civil Engineering, Courses
50. Classical Greek
133. Classical Studies
107. Cytotechnology, See Agronomy
42. Clothing/See Textiles and Clothing
20. Coaching Interscholastic Athletics
20. College Work-Study Program
25. Colleges and Curriculum
195. Communication Disorders
20. Communication/See English, Journalism and Mass Communication and Speech
107. Community and Regional Planning Courses
40. Community Nutrition, Curriculum/See also Food and Nutrition
23. Computer Science, Courses/See also Sciences and Humanities, Curriculum
109. Computer Science, Courses/See also Sciences and Humanities, Curriculum
110. Construction Engineering, Courses
59. Curriculum
24. Continuing Education
24. Cooperative Extension Service in Agriculture and Home Economics
48. Cooperative Programs, College of Engineering
18. Counseling Service
182. Counselor Education
75. Course Numbers
75. Courses and Programs
39. Craft Design
2. Creative Writing/See English
75. Credit, Definition of
10. Credit by Examination
80. Crop Production and Physiology, Major
55. Cross-Cultural Programs, Home Economics
187. Cross-Disciplinary Programs, Sciences and Humanities
183. Curriculum and Instructional Media, Courses
26. Curriculum Requirements
181. Cytotechnology, Preprofessional Study
34. Dairy Science, Curriculum/See also Animal Science Courses
46, 173. Dance Option
21. Debate and Forensics
26. Degree Requirements, Bachelor's Graduate College
71. Degrees Awarded, Summary of
234. Dental Hygiene, Preprofessional Study
181. Dentistry, Preprofessional Study
181. Design and Patternmaking/See Textiles and Clothing
38. Design, College of
38. Advising System
38. Curricula
36. Departments
36. High School Preparation
36. Honors Program
36. Professional Opportunities
36. Requirements
13. Scholarships
111. Design Studies, Courses
29. Designations
57. Detectives, Curriculum
73. Dissertation, Ph.D
188. Distributed Studies
72. Doctor of Philosophy Degree
26. Dormitories/See Residence Halls
26. Double Majors
22. Drama Courses/See English and Speech
146. Dramatics
42. Driver Education, Fee
27. Teaching Specialization
27. Dual Degree Programs
112. Earth Sciences, Courses and Programs
190. Teaching Specialization/See also Sciences and Humanities, Curriculum
114. Ecology/See Animal Ecology and Environmental Studies
114. Economics, Courses
191. Teaching Specialization/See also Sciences and Humanities, Curriculum
41. Education, College of
41. Admission to Undergraduate Teacher Education Program
42. Areas of Specialization, Requirements for Advisors for
41. Curricula and Special Programs
41. Departments