GOVERNMENT OF THE IOWA STATE COLLEGE

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 the Iowa State College of Agriculture and Mechanic Arts. The college is governed by the State Board of Regents, 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 college are delegated by the Board of Regents to the President and Faculty of the college. The Board appoints a Finance Committee whose members give their entire time to consideration of the financial activities of the five state educational institutions under statutory provisions and such rules and regulations as the State Board of Regents may prescribe.

MEMBERS OF THE BOARD

Arthur Barlow
Lester S. Gillette
Richard H. Plock
Mrs. Morris Berkness
Roy E. Stevens
Clifford Strawman
Mrs. Kenneth A. Evans
Harry H. Hagemann
Mrs. Joseph F. Rosenfield

Cedar Rapids
Fostoria
Burlington
Armstrong
Ottumwa
Anamosa
Emerson
Waverly
Des Moines

FINANCE COMMITTEE

David A. Dancer, Secretary
Carl Gernetzky
Arthur B. Walsh

Des Moines
Des Moines
Des Moines
The Iowa State College Campus with Veterans Housing Area
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Veterinary Anatomy
Veterinary Hygiene
Veterinary Medicine and Surgery
Veterinary Obstetrics and Radiology
Veterinary Pathology
Veterinary Physiology and Pharmacology
Vocational Education
Zoology and Entomology

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Experiment Stations and Research Institutes

Agricultural, Engineering, Industrial Science, Institute for Atomic Research, Ames Laboratory of the Atomic Energy Commission, Veterinary Medical Research Institute, Iowa Veterinary Medical Diagnostic Laboratory, Statistical Laboratory, Veterinary Medical Clinics.

Extension Services
Agricultural, Home Economics, Engineering

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Summary of Enrollment
Short Courses
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# College Calendar 1957-1958

## FALL QUARTER

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<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 18</td>
<td>Wednesday, 1:00-5:00 P.M.</td>
<td>Special Examinations</td>
</tr>
<tr>
<td>September 18</td>
<td>Wednesday, 10:30 A.M.</td>
<td>Opening Faculty Convocation</td>
</tr>
<tr>
<td>September 19-20</td>
<td>Thursday and Friday</td>
<td>Examinations to Remove Conditions</td>
</tr>
<tr>
<td>September 19-24</td>
<td>Thursday to Tuesday</td>
<td>Freshman Days</td>
</tr>
<tr>
<td>September 23-24</td>
<td>Monday and Tuesday</td>
<td>Registration</td>
</tr>
<tr>
<td>September 25</td>
<td>Wednesday, 7:00 A.M.</td>
<td>Class Work Begins</td>
</tr>
<tr>
<td>October 17</td>
<td>Thursday, 4:00-6:00 P.M.</td>
<td>Senior English Examination</td>
</tr>
<tr>
<td>November 1</td>
<td>Friday</td>
<td>Mid-Quarter Reports Due</td>
</tr>
<tr>
<td>November 27-December 2</td>
<td>Wednesday, 11:00 A.M. to Monday, 7:00 A.M.</td>
<td>Thanksgiving Vacation</td>
</tr>
<tr>
<td>December 18</td>
<td>Monday</td>
<td>Examinations Begin</td>
</tr>
<tr>
<td>December 20</td>
<td>Friday, 9:30 A.M.</td>
<td>Graduation Exercises</td>
</tr>
</tbody>
</table>

## WINTER QUARTER

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 6</td>
<td>Monday</td>
<td>Special Examinations</td>
</tr>
<tr>
<td>January 7</td>
<td>Tuesday, 7:00 A.M.</td>
<td>Registration</td>
</tr>
<tr>
<td>January 23</td>
<td>Thursday, 4:00-6:00 P.M.</td>
<td>Class Work Begins</td>
</tr>
<tr>
<td>February 14</td>
<td>Friday</td>
<td>Senior English Examination</td>
</tr>
<tr>
<td>March 17</td>
<td>Monday</td>
<td>Mid-Quarter Reports Due</td>
</tr>
<tr>
<td>March 21</td>
<td>Friday, 9:30 A.M.</td>
<td>Examinations Begin</td>
</tr>
<tr>
<td>June 6</td>
<td>Monday</td>
<td>Graduation Exercises</td>
</tr>
</tbody>
</table>

## SPRING QUARTER

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 24</td>
<td>Monday, 8:00 A.M.</td>
<td>Special Examinations</td>
</tr>
<tr>
<td>March 25</td>
<td>Tuesday, 8:00 A.M. to 4:30 P.M.</td>
<td>Registration</td>
</tr>
<tr>
<td>March 26</td>
<td>Wednesday, 7:00 A.M.</td>
<td>Class Work Begins</td>
</tr>
<tr>
<td>April 4-8</td>
<td>Friday, 8:00 A.M. to Tuesday, 6:00 A.M.</td>
<td>Easter Recess</td>
</tr>
<tr>
<td>April 17</td>
<td>Thursday, 4:00-6:00 P.M.</td>
<td>Senior English Examination</td>
</tr>
<tr>
<td>May 2</td>
<td>Friday, 5:00 P.M.</td>
<td>Mid-Quarter Reports Due</td>
</tr>
<tr>
<td>May 30</td>
<td>Friday</td>
<td>Memorial Day Holiday</td>
</tr>
<tr>
<td>June 9</td>
<td>Monday</td>
<td>Examinations Begin</td>
</tr>
<tr>
<td>June 14</td>
<td>Saturday, 9:30 A.M.</td>
<td>Commencement</td>
</tr>
</tbody>
</table>

## SUMMER QUARTER

### First Session

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 17</td>
<td>Tuesday</td>
<td>Registration</td>
</tr>
<tr>
<td>June 18</td>
<td>Wednesday</td>
<td>Class Work Begins</td>
</tr>
<tr>
<td>July 4</td>
<td>Friday</td>
<td>Independence Day</td>
</tr>
<tr>
<td>July 25</td>
<td>Wednesday</td>
<td>First Term Closes</td>
</tr>
</tbody>
</table>

### Second Session

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 23</td>
<td>Wednesday</td>
<td>Registration</td>
</tr>
<tr>
<td>July 24</td>
<td>Thursday</td>
<td>Class Work Begins</td>
</tr>
<tr>
<td>August 26</td>
<td>Friday</td>
<td>Second Term Closes</td>
</tr>
</tbody>
</table>
College Calendar
1958-1959

FALL QUARTER

September 3, Wednesday, 1:00-5:00 P.M.
Examinations to Remove Entrance Deficiencies, or to Secure Advance Standing
Opening Faculty Convocation
Examinations to Remove Conditions
Freshman Days
Registration
Class Work Begins
Senior English Examination
Mid-Quarter Reports Due
Final Date for Filing Diploma Slips
Examinations Begin
Graduation

WINTER QUARTER

December 1, Monday
Examinations to Remove Entrance Deficiencies, to Secure Advance Standing or to Remove Conditions.
Registration
Class Work Begins
Senior English Examination
Christmas Recess
Mid-Quarter Reports Due
Final Date for Filing Diploma Slips
Examinations Begin
Graduation

SPRING QUARTER

March 3, Tuesday
Examinations to Remove Entrance Deficiencies, to Secure Advance Standing or to Remove Conditions
Registration
Class Work Begins
Senior English Examination
Easter Recess
Mid-Quarter Reports Due
Final Date for Filing Diploma Slips
Examinations Begin
Commencement

SUMMER QUARTER

First Session

Registration
Class Work Begins
Independence Day
First Quarter Ends

Second Session

Registration
Class Work Begins
Second Quarter Ends
Officers of Administration

JAMES H. HILTON, B.S., M.S., D.Sc. .................. President of the College
J. H. JENSEN, B.S., M.A., Ph.D. ..................... Provost

CHARLES EDWIN FREILEY, B.S., A.M., LL.D., Sc.D. ........ President Emeritus and Professor of Vocational Education
RAYMOND MOLLYNEAUX HUGHES, M.S., LL.D. ............... President Emeritus

DEANS AND DIRECTORS

FLOYD ANDRE, Ph.D. .................. Dean of the Division of Agriculture,
                                  Director of the Agricultural and Home Economics Extension
                                  Service and the Agricultural Experiment Station
J. F. DOWNIE SMITH, M.E., Sc.D. ............. Dean of the Division of Engineering,
                                  Director of the Engineering Experiment Station and
                                  Engineering Extension Service
HELEN R. LeBARON, Ph.D. .................. Dean of the Division of Home Economics
RICHARD S. BEAR, S.B., Ph.D. ............. Dean of the Division of Science,
                                  Director of the Industrial Science Research Institute
IVAL ARTHUR MERCHANT, D.V.M., Ph.D. ........ Dean of the Division of
                                  Veterinary Medicine, Director of the Veterinary Medical Research Institute
RALPH M. HIXON, Ph.D. .................. Dean of the Graduate College
FRANK H. SPEDDING, Ph.D., LL.D., D.Sc. .... Director of the Institute
                                  for Atomic Research
MILLARD R. KRATOCHVIL, A.B., A.M. ........ Director of Student Affairs
Arthur M. Gowan, Ph.D. .................. Registrar and Examiner

OFFICE OF THE BUSINESS MANAGER

BOYNE H. PLATT, B.S. .................. Business Manager and Secretary
J. E. MARKS, M.A., C.P.A. .................. Assistant Business Manager in Charge of Accounts
BEN W. SCHAFFER, B.S. .................. Superintendent, Physical Plant
L. E. SAUVAIN .......................... Purchasing Agent
J. C. SCHILLETTER, Ph.D. .................. Director of Residence
EDGAR P. SWANSON, M.S. .................. Supervisor of Employment

OFFICE OF THE TREASURER

J. F. HALL ........................... Treasurer
FRIEDA KANKE .................. Assistant to the Treasurer
VERA ANDERSON .................. Cashier

OFFICE OF THE REGISTRAR

Arthur M. Gowan, Ph.D. .................. Registrar and Examiner
WAYNE A. DeVaul, B.S. .................. Assistant Registrar
FRED C. SCHLUNZ, M.S. .................. Assistant to Registrar
MARY ESTHER PETERS, B.E. .............. Assistant Examiner
ESTHER L. RAWSON .................. Recorder
OFFICERS OF ADMINISTRATION

STUDENT HEALTH SERVICE

John Gray Grant, M.D. ... ... ... ... ... ... ... ... ... ... ... ... Director
Gail A. McClure, M.D. ... ... ... ... ... Assistant Director and Adviser for Women
Lynn Dodge, M.D. ... ... ... ... ... ... ... ... ... ... ... ... Medical Adviser for Men
Pak Chue Chan, M.D. ... ... ... ... ... ... ... ... ... ... ... ... Medical Adviser for Men
Cecil V. Hamilton, M.D. ... ... ... ... ... ... ... ... ... ... ... ... Medical Adviser for Men
John F. Bacon, M.D. ... ... ... ... ... ... ... ... ... ... ... ... Radiologist
Margaretha E. Hansen, R.N. ... ... ... ... ... ... ... ... ... ... Supervisor of Nurses

LIBRARY STAFF

Robert William Orr, M.S., Director
Grant David Hanson, A.M.L.S., Assistant Director
Charles Harvey Brown, M.A., B.L.S., Litt.D., Bibliographer
Dorothea Marie Hunt, B.S., Instructor
Mildred Hicks McHone, B.S., Circulation Librarian
John Calvin Mcnee, A.M.L.S., Head, Circulation Department
Arlene Frances Martenson, B.S., Instructor
Janice Anita Moe, B.A., Reference Librarian
Grace Myrtle Oberheim, M.S., Head, Order Department
Lola Frances Quinlan, B.A., M.A., Order Librarian
Eva Lanning Robbins, B.S., Instructor
Joanne Ruth Scanlan, B.S., Cataloger
E. Marjorie Smith, M.A., Cataloger
Eleanor Frances Warner, M.A., B.L.S., Exchange Librarian
Evelyn Wimbersberger, M.S., Head, Catalog Department
Elizabeth Arnold Windsor, M.S.L.S., Head, Reference Department

CHRISTIAN ASSOCIATIONS

Harold R. Reinhart, B.S. ... ... ... ... ... ... ... ... ... ... ... ... Secretary of the Y.M.C.A.
Mrs. Margaret H. Thompson, M.A. ... ... ... ... ... ... ... ... ... ... Director of the Y.W.C.A.
General Information

Historical Summary

In initial influence and aim, the Iowa State College of Agriculture and Mechanic Arts was an outgrowth of the industrial movement in education which sought to provide a training in harmony with the new economic and social order resulting from profound changes in industry and agriculture. Following agitation by state and local agricultural and horticultural societies, on March 22, 1858, a group of young legislators, enthusiastic for higher education, secured the establishment of a "State Agricultural College and Model Farm to be connected with the entire Agricultural Interests of the State," with an appropriation of $10,000 for the purchase and improvement of the lands. Story and Boone counties provided bonds, private subscriptions and land gifts that more than doubled the appropriations and a farm of 648 acres upon the open prairies of Story County was purchased. In the succeeding years beginnings were made in developing the farm, but financial depression, confusion of civil strife and the lack of general interest delayed for a decade the construction of buildings and the beginnings of instruction.

Meanwhile the Morrill Land-Grant College Act of 1862 gave federal aid to industrial education. The Iowa legislature was the first to accept the provisions of the act, September 11, 1862. The college received students for preparatory training October 21, 1868, and the formal opening, with the dedication of the first building and the inauguration of the first president, was on March 17, 1869.

For the first three decades current funds were secured from the land endowment; state appropriations were wholly for capital needs. Since 1900 the legislature has contributed to the educational support. As the state’s land-grant institution the college has shared in the supplemental congressional acts for general support—the second Morrill (1890), the Nelson (1907) and the Bankhead-Jones (1935). Until 1909 the government was vested in a separate board of trustees; since that date the control has been in the centralized State Board of Regents.

During the formative years the full land-grant program was forecasted—in instruction, research and extension. The specified lines of agriculture, mechanical arts and military tactics, with appropriate supporting studies, were developed at the start and the range has been progressively expanded to meet changing conditions in the industries and in social organizations. Veterinary instruction was offered to the first class in the agricultural course and in 1879 this study was organized as a separate school—the first in the country to be founded by a state. The college was co-educational from the beginning and a special science course for women was early developed. Instruction in domestic economy was offered in 1872 and in 1875 the nation's first collegiate experimental kitchen was opened.

During the college year 1902-1903 agriculture, engineering, veterinary science, and science related to the industries (industrial science from 1914-1915) were organized into distinct divisions and home economics was given this status in 1914-1915. Graduate study has been offered since 1873. The Graduate College was created in 1919.

Following the federal Hatch Act (1887), the Agricultural Experiment Station was founded and the work has expanded with the demands of the occupation and with the aid of additional federal acts—Adams (1906), Purnell (1925), and Bankhead-Jones (1935)—state appropriations and special subventions. The Engineering Experiment Station was created by state act in 1904.

Farmers' institutes were conducted by the president and staff as early as 1870 and were continued for three decades. At the beginning of the century short courses were developed to meet general and special needs. The Agricultural Extension Service was created in 1906, and the Engineering Extension Service in 1913. All phases of the agricultural and home economics extension program have been expanded and symmetatized by the Smith-Lever (1914) and Capper-Ketcham (1928) Acts. Vocational education train-
ing has been developed to provide instructors and supervisors for the federal-state system established by the Smith-Hughes (1917) and George-Deen (1936) Acts.

While the present designation was anticipated in various administrative reports from the early eighties, the official change of name from “Iowa State Agricultural College and Farm” to the “Iowa State College of Agriculture and Mechanic Arts” was not made until 1896. The college motto, “Science with Practice,” was first used by the student publication *The Aurora* in June 1873.


**Degrees**

In the Divisions of Agriculture, Engineering, Home Economics and Science, the baccalaureate degree conferred is Bachelor of Science. The degree of Bachelor of Architecture is also conferred in the Division of Engineering. The degree of Doctor of Veterinary Medicine is conferred upon the completion of the curriculum in veterinary medicine. In the Graduate College the degrees conferred are Master of Science and Doctor of Philosophy. For professional degrees in the Division of Engineering, see page 61.

The college, in cooperation with the Army, Navy and Air Force, conducts an ROTC program which prepares graduates who have completed the advanced courses for an officer’s commission in the Reserve Forces of the United States Army, Navy or Air Force. Two years of basic military training, or equivalent, is required of men for graduation.

**CO-OPERATIVE PROGRAM LEADING TO TWO DEGREES.** Students who complete the first three years in the curriculum in science and subsequently complete the first year in a medical, dental, veterinary or law curriculum will be awarded the degree of Bachelor of Science from Iowa State College. Also, students who complete the first three years in the curriculum in agricultural economics or industrial administration, followed by one year of law in a recognized law college, will be awarded the degree of Bachelor of Science. By this arrangement the student can reduce to a minimum the time required to earn a bachelor of science degree from this college and a degree in one of the fields named above.

**Sessions**

The college year is divided into four quarters approximately twelve weeks in length. These quarters begin in June, September, January and March and are designated as the Summer, Fall, Winter and Spring quarters, respectively.

To accommodate students who cannot attend for the entire period, the summer quarter instruction is divided into two six-week terms. Students may enroll for either term or for the full quarter.

**Location**

Ames is located almost at the geographical center of the state of Iowa, on the main line of the Chicago and North Western Railroad. Several bus lines pass through Ames making the city accessible by bus from all sections of Iowa and neighboring states.

Down through the years, the city of Ames has co-operated with the college in maintaining an environment which exerts a wholesome influence upon the student body. The city has an excellent system of public schools, numerous churches and a good municipal government. Living conditions are very attractive for heads of families who wish to educate their children and enjoy the advantages of living in a college town.

**Buildings**

Seventy-two buildings for college purposes besides dwelling houses and the buildings for farm stock, machinery and service departments have been erected by the state for the various departments of the college. The map in the front of the catalog gives the names of the buildings and their locations.
The Division of Agriculture classrooms, laboratories and offices are in Curtiss Hall, Dairy Industry Building, Agricultural Annex, Agronomy Building, Genetics Laboratory, Horticultural Building and Greenhouses, Landscape Architecture Studio, Meats Laboratory, Judging Pavilions and Barns and at the Poultry Farm, Agronomy Farm, Animal Husbandry Farm, Dairy Husbandry Farm and the Agricultural Engineering Hall and Farm.

The Division of Engineering classrooms, laboratories and offices are in Marston Hall, Engineering Annex, Industrial Education Shops Building, Electrical Engineering Building, Exhibit Hall, Mechanical Engineering Laboratories, Building A, T.A.M. Laboratory, Chemical Engineering Hall, Aeronautical Laboratory and Agricultural Engineering Hall and Farms.

The Division of Home Economics classrooms, laboratories and offices are in Home Economics Hall, Physical Education Building for Women, Nursery School and four Home Management Houses.

The Division of Science classrooms, laboratories and offices are in Beardshear Hall, Botany Hall, Chemistry Hall, Physics Hall, Science Building, Insectary, Armory, Men's Gymnasium and Stadium, Music Hall, Naval Armory and the Theater Workshop.

The Division of Veterinary Medicine classrooms, laboratories and offices are in the Veterinary Quadrangle and Stange Memorial Clinic and at the Veterinary Research Institute Farm.

The Institute for Atomic Research laboratories and offices are in the Metallurgy Building, Chemistry Hall, Physics Hall, the Institute Office and Laboratory Building and the Synchrotron Building.

Many temporary buildings have been constructed on the campus, thus expanding the present facilities to take care of a large student body.

The College Library

The college Library affords an opportunity to students and faculty to have access to the publications needed in their varied activities. The Library's collections now number about 470,000 carefully selected volumes chiefly in the basic and applied sciences. Its collections of periodicals are unusually complete in botany, chemistry, entomology, mathematics, physiology, physics and veterinary medicine. At the present time the Library is receiving over 8,000 periodicals and other serial publications in many languages. Books necessary for class work, research, reference and avocational reading are also included in the collections.

Every feasible means is employed to encourage greater use of the books and facilities of the Library. Reference and circulation librarians make up a public service staff whose chief duty is to see that books and information are secured quickly and efficiently by all who wish them. Both formal and informal instruction in the use of books and libraries are offered to graduate and undergraduate students. Displays of new and outstanding books on various subjects of unusual interest are maintained in the lobbies of the Library throughout the year. Bulletin boards and special display cases are used for exhibits of posters, photographs and charts. Additional wings to the Library are planned, which will make possible more adequate library service to students, members of the faculty and visitors to the campus.

Personnel Service

The Personnel Service is organized for the benefit of the students, the alumni, the faculty and all organizations and individuals interested in the development of students or in the employment of either students or alumni. The personnel officers are concerned with students as individuals in the process of adjusting to life.

Records. Complete information is secured from each entering student concerning his family, high school record and practical experiences. A battery of tests measuring scholastic aptitude, silent reading ability and English training are given at entrance. Scores from these tests are assembled on the student's cumulative personnel envelope and the adviser
envelope. During his residence in college complete and detailed information concerning the student is added to his preliminary material.

ADVISING. Upon entering college, each student is assigned to an adviser who has been selected from the faculty of the division in which the student plans to study. These advisers, under the direction of their Divisional Dean, will aid the students in achieving their educational goals.

Student Counseling Service

The Student Counseling Service, organized in 1939, serves as a testing and counseling center for college students and a limited number of high school pupils. The program, organized primarily on a service basis, is aimed to carry out the following general functions: test freshmen and prospective college students; assist departments and individuals with special testing problems; assist in student selection and evaluation for graduate work or special industrial programs; cooperate with colleges, federal and state agencies, municipalities and industrial concerns for selection purposes; participate in national testing programs; counsel students with educational and vocational problems; aid in personal adjustment problems; counsel in the area of courtship and marriage; cooperate with the Student Health Service in cases of marked mental maladjustment; serve as a laboratory for the training of students in testing and vocational counseling and conduct research in the development of tests and counseling methods.

SOCIAL LIFE. Under the supervision of a social director, a well-balanced all-college social program is planned and carried out by the students themselves. Through this medium, the Personnel Service is ready to help the student in developing those traits of personality and character that will not only create a favorable impression but also contribute to his usefulness in later life.

ALUMNI SERVICE. Placement officers in each division serve the alumni by supplying information concerning positions available. Any alumnus interested in securing employment or in changing his position may write to the placement officer of the division from which he was graduated.

Employment of Students

To assist students in securing part-time employment, Iowa State College maintains a student employment office in room 101, Building H. This office accepts applications for part-time employment as well as calls from employers on the campus and in the community. Students and others wishing part-time employment should stop at the employment office and discuss their situation, after arriving on the campus.

A student should not plan to do much outside work the first quarter of school because of the orientation that is necessary to become acquainted with college life. If the student is planning to earn a large part of his expenses, it is advisable to carry a light schedule of classes.

Student Health Service

The college recognizes the importance of the student's health to successful college work. Good health does not assure success but poor health may be an important factor in failure.

HEALTH EXAMINATION. Each new student entering Iowa State College is required to have a physical examination before registering. Students accepted for admission will be sent forms to be filled out by the student's physician and returned promptly by him to the Student Health Service. These reports will be studied by the college physicians before college opens so that each student will be placed in appropriate physical education classes and, where necessary, excused from military training. Students neglecting to have their physical examination before coming to college will be given a choice of having an Ames physician, or a physician of their choice elsewhere, make the examination or of having it made by the College Health Service staff for a fee of $5. The College Health Service staff will be pleased to cooperate with the family physician in any corrective measures he may recommend.

All entering students are required to have a chest x-ray at the College Hospital.
Prospective students are urged to have any remedial defects of vision corrected and necessary dental work done before entering college. They are also urged to be vaccinated for smallpox and to receive tetanus toxoid inoculations before leaving home.

**MEDICAL AND SURGICAL SERVICE.** In order to furnish complete medical care and advice for sick students as promptly and conveniently as possible, the college has provided a well-equipped modern hospital and dispensary for the care of students with conditions requiring hospital service and for attention of the lesser ailments that can be cared for in the dispensary without hospitalization.

All students who pay the full registration fee are insured medical and routine nursing service by the college medical and nursing staff in case they come to the hospital or dispensary. Medicines and service, such as x-ray, may be supplied on a cost basis. Students entering the hospital will be given three days' service without charge. For all time in excess of three days per college year, the student is charged a very reasonable rate per day to cover board, room, light and heat. In case a special nurse or physician is employed, the expense shall be borne by the patient.

**PREVENTION OF INFECTIOUS DISEASES.** An important part of the work of the Health Service is the prevention of epidemic diseases. All such cases are isolated and contacts with them are kept under such supervision as may be required in accordance with modern epidemiological methods.

The college physicians are authorized to exclude from the dormitories and the recitation rooms any person afflicted with a contagious disease, and in case of necessity, those coming in contact with such disease.

**Religious Life at the College**

Iowa State College is deeply interested in the moral and spiritual development of its students and, in cooperation with the churches and citizens of Ames, provides a wholesome and stimulating spiritual atmosphere.

The college itself sponsors a fall and spring all-college religious convocation and a week in the winter quarter in which nationally known religious speakers are brought to the campus. Iowa State's Religion in Life Week is one of the more successful as well as one of the oldest in the United States. These, and other religious activities, are planned and coordinated by the Student Religious Council. The Council of Religion, composed of one faculty person and one professional worker from each religious group serving the campus, acts in an advisory capacity.

Some of the large denominations have erected student centers as well as churches near the campus, and many employ one or more professionally trained advisers and pastors who devote their entire time to students. Church-going is a continuing tradition at Iowa State, and student religious groups are among the strongest of the campus organizations.

The non-denominational Young Men’s and Young Women’s Christian Associations and the Inter-Varsity Christian Fellowships carry on a somewhat more campus-centered program of meetings, discussions and study. The two “Y’s”, through their various activities, have profoundly influenced the student life at Iowa State College. The Y.M.C.A. has conducted a freshman orientation camp since 1927, and all college groups are welcome to use the “Y’s” Lynn Fuhrer Lodge for retreats. The Y.M.C.A. and Y.W.C.A. share Alumni Hall, a large building at the center of the campus.

The Director of Student Affairs is responsible for coordinating the various religious activities, and for planning those which are college-sponsored.

**Concerts**

The College Artist Concert Series, given each season, brings to the campus the country’s outstanding artists and musical organizations. During the past season the series included the opera, “A Secret Marriage” by the Goldovsky Opera Theatre; Igor Gorin, baritone; Roger Wagner Chorale and the Cincinnati Symphony Orchestra.

In addition, several concerts are given each season by members of the Department of Music faculty, the Iowa State College Symphony Orchestra, Concert Band and the Iowa State Singers, giving renditions of the finest in instrumental and vocal literature. A Christmas Festival of Music is presented annually.
Lectures

The college brings to the campus each year a wide variety of lectures. Recently the college has adopted the plan of bringing to the campus, for several days of lectures and conferences, speakers who have won recognition for their creative work and their ability to present effectively the principles of appreciation. Some of the distinguished guests to appear before student audiences this season are the Honorable Herbert Morrison, Hanson Baldwin and Marquis Childs.

Alumni Association

The Alumni Association of Iowa State College was organized in 1878. Its purpose is to promote the highest interests of the institution and to increase friendship and sympathy among students and alumni.

The offices of the Association are off the main lobby, Memorial Union, where all Iowa State men and women will find a hearty welcome.

The present officers of the Association are:
- President, Douglas F. Graves, Chicago, Illinois.
- Vice-President, Waldo W. Wegner, Cedar Rapids, Iowa.
- Recording Secretary, Lydia (Armstrong) Adams, Ames, Iowa.
- Treasurer, J. F. Hall, Ames, Iowa.
- Director of Alumni Affairs and Editor, Wallace E. Barron, Ames, Iowa.

The annual meeting and banquet are held commencement week.

Active local branches of the general association exist in all the principal cities of the United States and in various counties in Iowa.

*The Alumnus*, the official organ of the Association, appears bimonthly under the supervision of the Director of Alumni Affairs.

Alumni Achievement Fund

The Alumni Achievement Fund is an annual giving program sponsored by the Alumni Association for alumni, former students and friends of Iowa State College. Its purpose is to provide alumni an opportunity to assist in extending the usefulness, privileges and prestige of the college, and to help the college meet needs which would not be satisfied ordinarily through regular appropriations.

The Fund is administered by a board of eight trustees, which appoints the personnel necessary to conduct its business.

The present Board and Executive Officers are:

**Board of Trustees**
- Clay Stafford, Banker, Chairman.
- Lester S. Gillette, State Board of Regents.
- James H. Hilton, President, Iowa State College.
- Pauline W. Hillyard, Housewife.
- Kenneth R. Marvin, Faculty, Iowa State College.
- Harry L. Hoak, Contractor.
- A. A. McLaughlin, Attorney.
- R. C. Pollock, Campaign and National Fund Chairman.

**Executive Officers**
- Charles E. Friley, Honorary Fund Chairman.
- R. C. Pollock, National Fund Chairman.
- R. E. Buchanan, Assistant Fund Chairman.
- Joel E. Nystrom, Assistant Fund Chairman.
- J. F. Hall, Treasurer.
- W. E. Barron, Secretary.
- John E. Granson, Director.

Offices for the Alumni Achievement Fund are in Room 242, Memorial Union.
Memorial Union

Launched by alumni as a memorial to the service of sons and daughters of the college in World War I, Memorial Union has become a memorial to all Iowa State men and women who have served in the armed forces of our country. This building and its services give expression to the realization that education includes training for dignified and gracious living as well as preparation for earning a livelihood. Here, in a wholesome college-club atmosphere, students, staff members and alumni mingle in a complex stream of social, recreational and extra-class activities which supplement and enrich technical training.

Memorial Union is the air-conditioned headquarters of such important campus organizations as the Alumni Association, the Cardinal Guild and the Ward System. In this building the Veishea Committee plans the annual all-college spring exposition and the Homecoming Committee prepares the welcome for alumni returning to alma mater in the fall. Here the alumnus finds a comfortable guest room when he returns to the campus. Great Hall with its lofty ceiling, wide floor, full-sized stage, pipe organ and varied equipment is the scene of inter-collegiate debates, all-college mixers, student balls, departmental banquets, student shows, parties, receptions and numerous conferences. The Commons is the informal, between-class meeting place of the student body.

Bowling, billiards, table tennis, bridge, checkers and chess are enjoyed by hundreds every day. Music, magazines and art exhibitions provide leisure-time opportunities for informal education and relaxation. Coffee forums, book reviews, panel discussions, conferences, committee meetings and other Memorial Union activities help make life at Iowa State a thrilling adventure in twentieth century living.

Fraternities and Sororities

A number of fraternities and sororities have established chapters at Iowa State College with the approval of the college authorities. These groups are subject to rules which have been worked out jointly by them and the faculty. They co-operate with the college in the improvement of scholarship, in the molding of character and in the all-around development of their members.

The national social sororities provide accommodations for approximately 450 women. To be considered for “rushing” and pledging a woman entering Iowa State College without previous college credit is required to have a high school average of 2.5 or rank in the upper one-third of her class. The average cost of living in a sorority house is about $72 a month for each member. This amount pays for board and room, chapter dues and social obligations. The average initiation fee is $54. All freshmen women are required to live in the residence halls for one year.

The social fraternities provide accommodations for approximately 1,500 men. To be eligible for rushing, a new student must have a high school average of 2.5 or rank in the upper one-third of his class. First-year students, who are invited to join, may live in fraternity houses. The cost of living in a fraternity house varies from $65 to $80 per month. This charge includes board and room, chapter dues and social functions. The initiation fee varies from $20 to $70.

All fraternities and sororities are officially responsible to, and under the supervision of the Director of Student Affairs. Staff members from the office of Student Affairs work closely with the Interfraternity Council and the Panhellenic Council to maintain high standards among Greek social groups.

The Ward System

The “Ward System” is an organization for men living outside residence halls and fraternities. It affords its members companionship and the opportunity to benefit personally through participation in student activities, both social and athletic. The system also encourages its members to take active part in the various all-college functions. By taking advantage of these opportunities, men in this organization may assist themselves in the development of leadership ability and social poise.

The residential area surrounding the college is at present divided into eight districts or “Wards”; concentrations of population govern the size of each. The business of each Ward is handled in meetings conducted by its own organization and officers, a faculty
man serving as adviser only. In these semi-monthly meetings a complete program of social affairs and athletic contests is sponsored and developed. The activities of the eight Wards are integrated by councils: Publicity, Social, Intramural, Program and Activities, composed of representatives of each Ward. A semi-monthly Ward newspaper is published and mailed to members just prior to the meetings. The liaison officers and the newspaper editor, along with the presidents of each Ward and the presidents of the councils, form the Executive Council. This Council is the legislative body of the System and determines the System's general policy.

The college office of Student Affairs offers its full support to the Ward System and assigns a staff member to serve as an adviser and provide personal contact with that office. All social activities, including dances, parties and picnics, are registered through this office and are thereby subject to the same college regulations affecting all campus groups. Athletic events, including touch football, basketball, softball, tennis and horse-shoes, are under the supervision of the Director of Intramural Athletics.

The membership in the Ward System, which provides for all of the System's activities, costs $4 for the entire year. Two dollars of this membership fee remains with the individual Ward to which the member belongs. The remaining $2 per member is used, according to the budget set up by the Executive Council, to defray the necessary expense of the many intra-Ward activities.

Men's Residence Association

The system of men's residence halls, operated under college authority, is known as the Men's Residence Association and serves approximately 2,000 men. Members are subject to all college rules. There is also a system of student government to facilitate group living.

The association, consisting of forty “houses” each containing 40 to 80 men, acts as an independent unit complete with its own elected officers. These officers are responsible for promoting the house’s social and athletic affairs with other organized college groups. Each house has an upperclassman head resident who serves as the contact between the college administration and the men.

A very active intramural sports program operates throughout the year, giving all men the opportunity to participate in every variety of sport. A sub-post office station in Friley Hall handles all mail and express for the men. The location of the men’s residence halls is unique in that they are within a few minutes walk of classrooms, laboratories and sports facilities.

Admission of Undergraduate and Special Students

Basic Preparation for College

The basic requirement for admission to college is graduation from an approved high school. Since not all persons who complete a high school program are adequately prepared for college study, it is desirable that students seeking admission to college will have:

1. Completed a balanced program of studies designed to insure a well-rounded background of knowledge in basic fields
2. Developed proficiency in the use of the English language in reading, writing and speaking
3. Acquired proficiency in basic mathematical skills
4. Developed effective study skills and work habits
5. Developed an adequate intellectual, physical and social maturity
6. Developed a sincere interest in further formal education
Some high school graduates, no matter what program of studies they have followed, have not adequately acquired the above qualities; consequently, they are not prepared to do work at the college level.

Although no specific pattern of high school subjects is essential to success in college, there are certain fields of study which, when properly taught, provide an opportunity for the student to secure a general background of primary importance for college study.

The following suggestions are made for the guidance of the high school student who is planning to go to college:

1. **ENGLISH.** Since the ability to write clearly and to read with understanding and appreciation is essential, it is highly desirable that the student complete three or four units in English.

2. **MATHEMATICS.** Not only as a tool to further learning but also as a part of basic education, mathematics has much to offer. At least one unit of algebra is required for admission to all curricula. Students planning to specialize in the sciences or in engineering should complete two and one-half, or more, units in mathematics. See specific requirements for admission, below.

3. **SOCIAL STUDIES.** Social studies—such as history, civics, government, economics, sociology and geography—are basic to the understanding and solution of contemporary problems in the community, in the nation and in the world. From two to four units may well be devoted to this area.

4. **THE SCIENCES.** The field is rich in possibilities for understanding the modern world. Two units in science might well be completed. For those who plan to emphasize science or engineering in college, three units would be helpful.

5. **FOREIGN LANGUAGES.** The prospective college student might well develop a basic reading or speaking knowledge of a modern foreign language. Some background in one of the classical languages would also be desirable.

6. **THE FINE ARTS.** This field offers opportunity for development in an important area of general education which can contribute much toward individual growth.

7. **OTHER SUBJECTS.** None of the foregoing statements should be interpreted as meaning that other subjects—agriculture, commercial subjects, home economics, industrial arts, speech, etc.—should be avoided. Such subjects, when properly studied, contribute materially to the educational growth of the individual and prepare him for continued study as well as for the more general activities of living.

**Procedure in Applying for Admission**

Each student who plans to enter the college for the first time must fill out an application for admission which may be secured by writing to the Registrar. The applicant must also file his previous academic records as specified in the following paragraphs:

1. High school graduates with no previous college attendance should forward a complete official transcript of all high school credits, certified by the principal or superintendent of the last school attended.

2. A student who has begun his college work elsewhere should forward (a) a complete official transcript of all high school credits, certified by the principal or superintendent of the last high school attended and (b) a complete official transcript from each college previously attended.

3. Those who are not high school graduates may be admitted to college by examination. If any high school work has been completed, file the record signed by the principal or superintendent of the last school attended. See page 17 for further details.

Applications and credits should be filed not less than two months prior to the opening day of the term the applicant wishes to enter so that there may be adequate time for detailed evaluation of the records. The Registrar will then notify the applicant of his admission status.

**Specific Requirements for Admission**

1. **GRADUATES OF APPROVED IOWA HIGH SCHOOLS.** Graduation from an approved high school is the basic requirement for admission to Iowa State College. A minimum of one
unit of algebra is required for admission to all curricula. The requirements for admission to the several divisions are given below.

(A) DIVISION OF AGRICULTURE. The curricula in forestry, industrial education and landscape architecture require one and one-half units of algebra and one unit of geometry. The curriculum in dairy industry requires one and one-half units of algebra but does not require geometry. The curriculum in agricultural journalism requires one unit of algebra and one unit of geometry. All other curricula require one unit of algebra and do not require geometry. The requirements for admission to agricultural engineering are the same as for the Division of Engineering.

(B) DIVISION OF ENGINEERING. One unit of geometry and one and one-half units of algebra are required. Students who have not completed all of these courses may take geometry or third semester algebra at Iowa State College.

Additional courses in high school mathematics are strongly recommended, as well as three or four units of English and all of the science courses available in the high school.

(C) DIVISION OF HOME ECONOMICS. One unit of algebra is required.

(D) DIVISION OF SCIENCE. For the curricula in Chemical Technology and Science, one and one-half unit of algebra and one unit of geometry are required. For the curriculum in physical education for men, one unit of algebra is required.

(E) DIVISION OF VETERINARY MEDICINE. One and one-half units of algebra and one unit of geometry are required. For the college subjects required see page 103. A literal marking system is used with the passing marks of A, B, C and D with corresponding quality points of 4, 3, 2, 1, respectively. The records of all applicants will be averaged on this basis. Iowa residents whose averages are below 2.0 will be admitted on limited enrollment.

II. GRADUATES OF HIGH SCHOOLS IN OTHER STATES. Requirements are the same as in "I" on page 16, except that non-Iowa students must have a better than average scholastic record, and be acceptable otherwise, to be considered for admission.

III. GRADUATES OF UNACCREDITED HIGH SCHOOLS. Admission will be granted upon demonstration of competence to undertake college work, if the student is acceptable otherwise. In general, the student will be required to make a satisfactory showing in a battery of tests covering general educational attainment and scholastic aptitude.

IV. APPLICANTS WHO ARE NOT HIGH SCHOOL GRADUATES. Only students who are well beyond the usual high school age should ask for admission prior to the completion of their high school program. Students who do not fall into this category may, on rare occasions, be considered for admission. Such a student must be at least seventeen years of age, demonstrate competence to do college work and have an unqualified recommendation from his high school principal.

V. SPECIAL STUDENTS. Mature students who do not wish to become candidates for a diploma or degree, may be admitted as special students to pursue courses which they are prepared to undertake. As a basis for admission, evidence of adequate educational accomplishment and approval of the divisional dean concerned will be required.

VI. ADVANCED STANDING. College credits earned in recognized colleges and universities will be given equivalent credit in so far as they apply on the curriculum chosen. Non-residents of Iowa will not be considered for admission unless their college credits average 2.25 according to the literal marking system set forth in "I" above. Iowa residents whose averages are below "C" may be admitted on limited enrollment. All transfer students will be given an examination to determine their proficiency in the use of English; those who do not use the language clearly and correctly will be required to take remedial work in English without credit.

Freshman Days

For many years Iowa State College has set a short period prior to the opening of the regular college year and designated it as “Freshman Days.” This orientation period for new students serves a three-fold purpose: First, to introduce new students to college life and assist them in making the transition from high school. Second, to provide a time when certain tests may be given, the purpose of these tests being to furnish to those
who are in charge of the advising and guidance program of the institution such information as will be helpful in planning the student's program. Third, to provide time to register each student in the curriculum he has chosen.

Parents of new students are cordially invited to visit the campus during Freshman Days. They are particularly urged to hear the opening address by the President at the first meeting at 8:00 a.m. and to attend the meeting at 10:00 a.m. for parents of students. At the latter meeting parents will have opportunity to meet the Director of Student Affairs.

Fees and Expenses

Fees given in this catalog become effective Fall Quarter 1957.

(Fees and tuition are subject to change without notice)

PAYMENT OF FEES. All fees must be paid on registration day at the beginning of each quarter.

REGISTRATION FEE: The registration fee is $77 per quarter for all divisions of the college. This fee covers laboratory fees; hospital service; use of library; membership in the Memorial Union; admission to athletic contests, concerts, lectures and debates; subscription to the several student publications.

NONRESIDENT TUITION: In addition to the registration fee, all students who are nonresidents of Iowa, except those in the Graduate College, will be charged $90 per quarter. Nonresident tuition is assessed in accordance with the regulations of the State Board of Regents which appear on page 20.

SUMMER QUARTER FEES:

<table>
<thead>
<tr>
<th>Registration Fee</th>
<th>Registration Fee and Tuition (Nonresidents of Iowa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 weeks</td>
<td>$77</td>
</tr>
<tr>
<td>6 weeks</td>
<td>40</td>
</tr>
<tr>
<td>3 weeks</td>
<td>27</td>
</tr>
<tr>
<td>2 weeks</td>
<td>24</td>
</tr>
<tr>
<td>1 week</td>
<td>15</td>
</tr>
</tbody>
</table>

SUMMER CAMPS:

Civil Engineering (6 weeks) ........... $40
(In addition to the registration and tuition fees there is an additional camp fee of $10.)

Forestry (6 weeks) ........... $40
(In addition to the registration and tuition fees there is an additional camp fee of $21 and approximately $71 for board.)

Forestry (10 weeks) ........... 77
(In addition to the registration and tuition fees there is an additional camp and board fee of approximately $150.)

Geology (8 weeks) ........... 62
(In addition to the registration and tuition fees there is an additional camp fee of $20.)
Home Management House Fee: Students who have reservations for Home Management House (475) pay $35 room rent before they preclassify for this course. Married women who do not stay overnight in the houses pay $17.50.

Students who cancel reservations after preclassification for winter, spring or summer quarters or after August 1 for fall quarter, forfeit one-half their room rent. All students pay a fee of $50 for board and incidentals upon moving into the house.

Bedding, linens and towels are furnished in the home management houses.

Registration Fees for Students With Fee Reductions (Scholars, Fellows and Graduate Assistants): For students with fee reductions (scholars, fellows and graduate assistants), the registration fee for each of the fall, winter and spring quarters is $27. For either term of the summer quarter, the fee is $16. This fee covers laboratory fees; hospital service; use of library; membership in the Memorial Union and incidentals.

Miscellaneous Fees

Fees for Special Students and Non-Collegiate Students: Students in either of these categories pay the same fees as do undergraduate students.

Fees for Light Classification: Iowa students taking less than nine credits will pay $9 per credit registration fee. The minimum registration fee charge is $27. Nonresident undergraduate and special students taking less than nine credits will pay $20 per credit. The minimum charge is $60. By an additional payment of $8 per quarter, such students will be entitled to admission to athletic contests, concerts, lectures and debates and to subscription to the student publications.

Fees for Auditors: This is the same as for light classification.

Late Registration: Any student who does not complete his registration on the regular registration day is charged a late registration fee. This fee is $5 for the first day and $1 additional for each day thereafter. The maximum charge is $10.

Activity Fee: Students whose fee payment does not cover the activity fee may, by paying $8, be entitled to admission to athletic contests, concerts, lectures and debates and to subscriptions to the several student publications.

Master's Degree Thesis Fee: A charge of $10 will be made to cover library costs and title publication in the Iowa State College Journal of Science.

A charge of $30 will be made to cover library costs, microfilming of the dissertation and publication of a 600-word abstract in Dissertation Abstracts. An additional charge will be made for abstracts which exceed 600 words.

Music Fees: Students register at Music Hall each quarter before they begin their lessons. Students who register late will not be charged for lessons missed because of late registration. All fees are payable at the Music Department before the registration is complete. Single lessons will be charged at the rate of $3.

Voice—10 lessons per quarter .................................. $25.
Piano—10 lessons per quarter .................................. $25. or 25.
Brass and Reed Instruments—10 lessons per quarter .... 20.
Harmony—Class lessons per quarter ............................. 10.
Violin—10 lessons per quarter .................................. $25.
Organ—10 lessons per quarter .................................. $25.
Violincello—10 lessons per quarter .............................. 25.
Practice Room—One hour each day of the quarter .......... 5.
Organ Practice ...................................................... 35c per hour

Off-Campus Classes: $9, per credit hour, minimum $27.
Interim Classification Fee: $9 per credit hour.
Driver Education Fee: $20.
Special Examination Fee: $5.
Special Women's Physical Education Fee: $10.
Change of Classification Fee: $1.
In Absentia Registration Fee: $3 per credit hour.

Classification of Residents and Nonresidents

Students enrolling at Iowa State College 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 a 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.

RESIDENCE FOR TUITION PURPOSES

Regulations regarding residence for admission, fee and tuition payment can generally be divided into two categories—those that apply to students who are minors and those that apply to students who are over twenty-one years of age. 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.

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 the father's death, the residence of the mother, is the residence of the unmarried or emancipated minor; but if the father and the mother have separate places of residence, the minor takes the residence of the parent with whom he lives or to whom he has been assigned by court order. The parents of a minor will be considered residents of Iowa if they have had a domicile within the state for six months immediately prior to the date of the minor's enrollment at Iowa State College.

A minor student whose parents move their residence from Iowa to a location outside of Iowa shall be considered to be nonresident after six months from the date of the parent's removal from the state.

In the event that the fact of nonresident emancipation is established, the emancipated minor assumes all of the responsibilities of an adult and must establish residence for tuition purposes by maintaining his residence within the state for twelve consecutive months while not in school, the same as in the case of any other nonresident adult.

STUDENTS OVER TWENTY-ONE YEARS OF AGE

A resident student twenty-one years of age or over is (1) one whose parents were residents of the state at the time he reached his majority, or (2) who, while an adult, has established a bona fide resident in the State of Iowa by residing in the state for at least twelve consecutive months immediately preceding registration. Bona fide residence in Iowa means that the student is not in the state primarily to attend a college: that he is in the state for purposes other than to attempt to qualify for resident status.

Any nonresident student who reaches the age of twenty-one years while a student at any school or college does not by virtue of such fact attain residence in this state for admission of tuition payment purposes.

GENERAL FACTS

The residence of a wife is that of her husband. A nonresident female student may attain residence through marriage, and correspondingly, a resident female student may lose residence by marrying a nonresident. Proof of marriage should be furnished to the Registrar at the time change of status is requested.

Persons who are moved into the state as the result of military or civil orders from the government, or the minor children of such persons, are entitled to residence status after residing in Iowa for six months. However, if the initial registration of the minor children precedes the arrival of the parents, nonresident tuition will be charged in all cases until the next registration after the conditions set forth above are met.

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 resi-
students so long as such residence is maintained, even though circumstances may require extended absence of said persons from the state. It is expected that persons who claim an Iowa residence while living in another state or country will provide proof of a continuous Iowa domicile such as (1) evidence that they have not acquired a domicile in another state, (2) they have maintained a continuous voting record in Iowa, and (3) they have filed regular Iowa income tax returns during their absence from the state.

The owning 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 wrong 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 session attended.

An alien domiciled in Iowa who has not made declaration of intention of citizenship, as evidenced by first naturalization papers, or appropriate immigration credentials, shall be classified as a nonresident.

**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 shall be final.

**Residence Halls, Pammel Court, Off-Campus Housing**

Nine residence halls provide excellent housing facilities for approximately 1,200 women. Three residence halls provide housing facilities for approximately 2,000 men. Over 1,000 units in temporary and permanent structures are available for families at Pammel Court.

Each student who desires to live in a residence hall or in Pammel Court is required to deposit $10 with the Director of Residence for the reservation of a room. The deposit will be retained until the room is released at the end of the quarter or at any time of withdrawal from college because of illness or for any reason beyond the student's control. At such time, the entire $10 deposit will be refunded, or such portion of it as the condition of the room may justify. If a request for cancellation of the room reservation is not received the deposit will be forfeited.

Address all correspondence concerning rooms to the Director of Residence, Friley Hall, Iowa State College, Ames, Iowa.

**Residence Halls**

The residence halls are operated on the American plan, and the fee for the quarter covers room and board. The cost of room and board in the residence halls for the academic year 1957-1958 will be $600. This fee is subject to change depending upon costs. The charge for each term or quarter is payable on registration day. Those applying for accommodations in the residence halls should realize that rooms are rented for the entire academic year.

**WOMEN:** All undergraduate women are required to secure rooms through the Office of the Director of Residence and to live in residence halls unless special arrangement is made. Rooms are furnished with single beds and mattresses, chest of drawers, study tables, straight chairs and one pull-up chair. Students furnish their own bedding, including mattress pad, pillow and bed linens as well as towels, curtains and throw rugs.

**MEN:** Rooms in the residence halls are furnished with single or double-deck beds, mattresses, chest of drawers, individual study desks and chairs. Students are expected to furnish their own bedding, including mattress pad, pillow and bed linens as well as towels, curtains and throw rugs.
Pammel Court

The college has provided 1,000 units consisting of quonset huts, barracks apartments, demountable houses and permanent apartments for families at Pammel Court, adjacent to the campus.

Detailed information concerning rental units will be sent upon request. Address correspondence to the Director of Residence, Friley Hall, Ames, Iowa.

Off-Campus

Information regarding rooms off-campus may be obtained by writing to the Director of Residence, Friley Hall, Iowa State College, Ames, Iowa. New students are advised to arrange for rooms before the opening of the quarter.

The prices of rooms off-campus at present are as follows: Where two occupy a room, $5 to $6 a week for each occupant; where one occupies a room, $6 to $8 a week. Students are expected to furnish their own linens. Board, at the time this goes to press, may be obtained for from $18 to $20 a week. The cost of room and board ranges from $23 to $28 a week.

Fees and Expenses

Each student must arrange for a room before registration. Board may be arranged for by the student after reaching Ames.

For information of students and others interested, the Student Housing Committee has prepared a standard set of requirements for householders furnishing rooms to students. The Committee reserves the right to forbid students to room in houses which do not meet these requirements. Copies of the regulations may be obtained by applying to the Director of Residence.

Estimate of Necessary Expenses for the Average Student During His First Year in College

<table>
<thead>
<tr>
<th></th>
<th>Residents</th>
<th>Nonresidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fee</td>
<td>$231</td>
<td>$501</td>
</tr>
<tr>
<td>Books and supplies</td>
<td>$65-105*</td>
<td>$65-105*</td>
</tr>
<tr>
<td>Board and room</td>
<td>600</td>
<td>600</td>
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</tbody>
</table>

*Students in engineering pay $105. However, engineering students who have a drawing set and slide rule may deduct from $35 to $40 from this figure. All students must purchase gymnasium suits at a cost of approximately $12. Students in the ROTC are required to make a deposit of $15 on the uniform.

The above estimates do not include the cost of clothing, transportation, and incidentals. The student's general expenses in addition to the items listed above are subject to the personal habits of the individual and vary according to the degree of economy exercised.

Prospective freshmen should consider carefully the cost of the first year. No one should enter college unless he has money, in his own right or from friends, to meet his expenses for the freshman year.

Loans

Loans are available to students when necessary as an aid in financing their education at Iowa State College.

Short-term loans may be had to meet financial emergency during any quarter. The money must be repaid before final examinations for that quarter are taken.

Longer term loans are available to sophomores, juniors and seniors to be paid back after graduation. The amount of these loans is limited to a maximum of $600 to any one student. Interest rate is 4 percent on the unpaid balance.

All applicants are required to have a creditable scholastic record, to present a satisfactory repayment plan, and to meet certain other requirements.

For more information, inquire at Student Loan Office, Room 101, Building H.
GENERAL SCHOLARSHIPS

Good in any Division of the College

(All scholarships are for one year only, unless otherwise indicated.)

*Alumni Achievement Fund Scholarships
For Undergraduates
Value: $198.
Qualifications: Superior scholastic standing, financial need, good character.
Established by the Alumni Achievement Fund through contributions by alumni of the college.
Apply to: Secretary, Scholarships and Awards Committee, 101 Building H.

Hazel Beck Andre Journalism Scholarship
For Juniors
Value: Not less than $100 and not more than $200.
Qualifications: Major or minor in journalism, definite creative writing ability, high scholarship, financial need.
Established in 1956 by Hazel Beck Andre.
Apply to: Department of Technical Journalism, 202A Press Building.

Athletic Scholarships
For Graduating High School Seniors
Value: May not exceed the cost of fees, tuition, books, room and board.
Qualifications: Students entering directly from high school; high scholarship, determined by test administered by the regular testing service of the college.
Established by Big Seven Conference schools in order to make it possible for student athletes to attend college.
Apply to: Department of Athletics, 202A Men's Gymnasium.

George W. Catt Memorial Scholarship
For Seniors
Value: Twelve for $300 each.
Qualifications: Good scholastic records. Student must have earned a major part of his expenses. The scholarship is to relieve students, in part, of the necessity of self-support and to allow more time for a broader course of study or participation in worth-while activities on the campus.
Established by Carrie Chapman Catt, a graduate of Iowa State College, through a trust fund in memory of her husband, George W. Catt.
No applications to be made.

Delta Delta Delta Scholarship
For an Undergraduate Woman
Value: $200.
Qualifications: Scholarship, character, financial need.
Established by the Iowa State College Chapter of Delta Delta Delta.
Apply to: Delta Delta Delta Sorority, 302 Ash Avenue, Ames, Iowa.

Farm Underwriters Association Scholarships
For 4-H Boys and Girls
Value: Three for $250 each.
Qualifications: Must be residents of Iowa and have outstanding records in 4-H projects, including farm fire prevention work in the current year.
Established by the Farm Underwriters Association of Chicago.
Apply to: 4-H Club Office, Agricultural Extension Service, Curtiss Hall.

*Only one application is necessary for the Merit Scholarship, the Alumni Achievement Scholarship, the General Motors (College Plan) Scholarship and the Lane-Wells Freshman Scholarship. An application for one of these general scholarships will automatically be considered for all four.
*General Motors (College Plan)*

For Freshmen

Value: Varies with need of student.

Qualifications: Scholarship, leadership, extracurricular activities, financial need.

Established in 1955 by the General Motors Corporation.

Apply to: Scholarships and Awards Committee, 101 Building H.

If an application has been made for a general scholarship, the application will automatically be considered for this scholarship. For general information consult the high school principal or write directly to Educational Grants and Scholarships, 9-262 General Motors Building, Detroit 2, Michigan.

The college does not administer the National Scholarship plan.

**Alice L. Graham Scholarships**

For Undergraduates

Value: Three scholarships of approximately $500 each.

Qualifications: Must be boys or girls of Protestant faith and good character who have been graduated from Cass County and Pottawattamie County high schools within two years prior to taking the competitive examination for the scholarship. Two must be residents of Cass County and one of Pottawattamie County, and must have maintained an average of 75 or better for four years of high school work.

Established under the terms of the will of Alice L. Graham.

Apply to: Cass County and Pottawattamie County superintendents of schools.

**W. I. Griffith Radio-Televison Scholarship**

For a Freshman

Value: $100.

Qualifications: Upper quartile of his high school class, who, through his record of interest both in school and out, demonstrates a desire to concentrate in the area of radio and television, or who wishes to combine the study of radio and television with some other major course of study.

Established in 1956 by Radio Station WOI in memory of W. I. Griffith, former director of Radio at Iowa State College, and pioneer in the field of educational broadcasting.

Apply to: Dean of Science.

**Iowa Finance Company Scholarship**

For a Freshman

Value: $200.

Qualifications: Financial need, scholarship, leadership, an earnest desire for college study; must live in one of the Iowa Finance Company Agency areas.

Originated in commemoration of the 45th anniversary of the Iowa Finance Company.

Apply to: The High School principal.

**Iowa State Club of Chicago Scholarship**

For an Undergraduate

Value: $360.

Qualifications: Scholarship, financial need, activities. Must come from suburban high schools making up the West Suburban and Suburban League of Chicago. Winner must maintain eligibility requirements through four years of college.

Established by the Iowa State Club of Chicago Scholarship Committee.

Apply to: High school principals of respective schools.

**Iowa Vocational Rehabilitation Scholarships**

For Undergraduates

Value: Registration fee and other assistance.

Qualifications: Disabled civilians who are found eligible for training to overcome handicaps.

*Only one application is necessary for the Merit Scholarship, the Alumni Achievement Scholarship, the General Motors (College Plan) Scholarship and the Lane-Wells Freshman Scholarship. An application for one of these general scholarships will automatically be considered for all four.*
Established by the Iowa Vocational Rehabilitation Division of the Iowa Board for Vocational Education.
Apply to: Registrar, 107 Beardshear Hall.

Junior Achievement National Scholarship
For an Undergraduate
Value: $300.
Qualifications: Merit, financial need and participation in Junior Achievement program.
Established by the Alumni Achievement Fund.
Apply to: National Scholarship Committee, Junior Achievement Inc., 345 Madison Avenue, New York 17, N.Y.

*Lane-Wells Scholarships
For Freshmen
Value: Two for $198 each.
Qualifications: Superior scholastic standing, financial need, good character.
Established by W. G. Lane and W. T. Wells, Alumni of Iowa State College.
Apply to: Scholarships and Awards Committee, 101 Building H.

Lane-Wells Scholarships
For Seniors
Value: Seven for $300 each.
Qualifications: Good scholastic records; must be earning a good share of college expenses.
No applications to be made. Candidates selected by divisional deans.

LaVerne-Noyes Scholarships
For Undergraduates
Value: $198.
Qualifications: Parents or grandparents must have been inducted into military service by May 11, 1918, or have had pre-Armistice overseas service. Scholarship, financial need. Student must present a copy of parent’s or grandparent’s discharge from military service along with his own birth certificate at time of application. No scholarship is granted until student has completed first quarter of college, but application may be made after mid-term of first quarter if grades at that time are at least 2.0.
Established by LaVerne Noyes of the class of 1872 to be used in certain colleges and universities for assistance to students who served in World War I or their blood descendants.
Apply to: Scholarships and Awards Committee, 101 Building H.

*Merit Scholarships
For Undergraduates
Value: The majority are for $198.
Qualifications: Superior scholastic standing, financial need, good character.
Established by the college.
Apply to: Scholarships and Awards Committee, 101 Building H.

National Association of Manufacturers Divisional Scholarships
For Juniors and Seniors
Value: $1,000.
Qualifications: Must be majoring in science, engineering or business administration.
Established by the National Association of Manufacturers.
Apply to: National Association of Manufacturers Divisional Scholarships, 201 North Wells Street, Chicago 6, Illinois.
Application blanks are available at Scholarships and Awards Office, 101 Building H.

*Only one application is necessary for the Merit Scholarship, the Alumni Achievement Scholarship, the General Motors (College Plan) Scholarship and the Lane-Wells Freshman Scholarship. An application for one of these general scholarships will automatically be considered for all four.
National Merit Scholarship
For Undergraduates
Value: $198.
Qualifications: Scholarship, financial need. Must take the college board entrance examinations by January 1 of each year, which are given at convenient locations.
Established in 1956 by the National Merit Scholarship Corporation.
Apply to: High school principal, or write directly to National Merit Scholarship Corporation, 1580 Sherman Avenue, Evanston, Illinois.

Radio Corporation of America-National Broadcasting Company Television Scholarship
For Undergraduates
Value: $800.
Qualifications: High scholarship, promise of outstanding professional success in television, merit.
Established in 1955 by the Radio Corporation of America.
Apply to: Dean of Science.

Technical Journalism Scholarships
For Freshmen
Value: $200.
Qualifications: Scholarship, financial need; must be entering Iowa State College for the first time enrolling in Agriculture or Science Journalism.
Established in 1952 by the Iowa State Chapter of Sigma Delta Chi, National Journalism Fraternity.
Apply to: Technical Journalism Department, 202 Press Building.

Veishea Scholarships
For Freshmen
Value: $500, $300, $200.
Qualifications: Scholarship, leadership, character. Must be residents of Iowa.
Established in 1954 by the Veishea Central Committee.
Apply to: High school principal.

Ward Scholarships
For Sophomores and Juniors
Value: Three for $198 each.
Qualifications: Must be members of the Ward System; scholarship, financial need and participation in Ward System Activities.
Established by contributions from Alumni of the Ward System, the residence organization for married and single men who reside off-campus.
No application to be made. Selections are made by faculty advisers to the Ward System.

J. R. Watkins Company 4-H Scholarships
For Freshmen (1 girl and 1 boy)
Value: $100 each.
Qualifications: Must be residents of Iowa entering Iowa State College for the first time. Selection is based upon accomplishments in 4-H work.
Established in 1951 by the J. R. Watkins Company.
No applications to be made. Selection is made by personnel of the 4-H Club Office of the Agricultural Extension Service.

Weed Broadcasting Scholarship
For a Senior or Graduate Student
Value: $500.
Qualifications: Enrollment at Iowa State College in good standing; must have demonstrated a professional interest in radio or television broadcasting as a career, showing outstanding promise of success in the field.
Established by Joseph J. Weed, president of Weed and Company, New York, for students seeking professional training and experience in radio or television at Iowa State College. Apply to: Director of WOI Radio-Television, Service Building.

WTTW-Iowa State College Summer Television Scholarship
For an advanced student enrolled in the radio and television training program at Iowa State College.
Value: $500.
Qualifications: Must be in good standing, having demonstrated a professional interest in television broadcasting as a career, showing outstanding promise of success in the field. Established in 1956 by the Chicago Educational Television Association and the Iowa State College alumni.
No applications to be made.

Madge Young Memorial Scholarship
For a Junior or a Senior
Value: $100.
Qualifications: Must be a member of the Men's Residence Association in good standing, showing service to the Men's Residence Association and the College; scholarship. Established in 1956 by the Men's Residence Association in memory of Mrs. Madge Young, a former residence adviser.
Apply to: House President of the Men's Residence Association.

GENERAL AWARDS

Faculty Women's Club Geneva Award
For Sophomores
Value: $60 for one or more.
Qualifications: Scholarship, accomplishment in YWCA work, interest in general college activities, personality.
Established by the Faculty Women's Club for the purpose of helping defray the expense of one or more delegates to the YWCA Central Student Conference at Lake Geneva, Wisconsin.

Faculty Women's Club Senior Award
For a Senior Woman
Value: $50.
Qualifications: High scholarship; self-support.
Established by the Faculty Women's Club for a worthy senior woman who has been self-supporting, in part, during her school years. Given toward the end of the winter quarter.

Faculty Women's Club International Award
For an Undergraduate Woman
Value: $50.
Qualifications: Deserving woman student in Iowa State College, preferably one from a foreign country.
Established in 1956 by the Faculty Women's Club. Given in winter quarter.

Bill Lane Memorial Award
For Undergraduates
Value: $500.
Qualifications: Must be an out-of-state male student showing outstanding scholastic ability as well as athletic prowess.
Missouri Valley Intercollegiate Athletic Association Medal
For Undergraduates
Value: A medal.
Qualifications: Outstanding record in scholarship and athletics.

Phi Kappa Phi Scholastic Achievement Award
For a Senior
Value: $25.
Qualifications: Highest scholastic record of all undergraduates elected to the honor society of Phi Kappa Phi each year.

Sigma Delta Chi Awards
For Undergraduates
Value: Certificates.
Qualifications: High 5 percent of journalism students in the College.
Established by the national fraternity of Sigma Delta Chi.

Sigma Delta Chi Award
For an Undergraduate
Value: A watch.
Qualifications: Outstanding service to campus journalism.
Established by the Iowa State Chapter of Sigma Delta Chi.

General Regulations

DISCIPLINE: The discipline of the college is confined mainly to dismissing those who prove, on fair trial, to be too independent to submit to needful authority, or too indifferent to take advantage of their opportunities. The final decision in all cases of discipline rests with the President of the college, except when he delegates such power in particular cases to the deans or to some one of the standing committees of the faculty.

NUMBER OF CREDITS: No student may classify in more than the maximum number of hours allowed in his curriculum per quarter unless by his previous record he has shown exceptional ability. The student will be allowed to drop such extra work only upon permission of the classifying dean; he may be required to drop it in case this or any other work in his schedule is being carried unsatisfactorily.

CLASSIFICATION: No student may be admitted to any class or dropped from it except by authority of the classifying officer. Students may not classify in conflicting courses without the approval of the departments concerned.

Students are required to classify in back studies at the earliest opportunity. Any exception to this rule must be for a good reason and must be approved by the classifying officer.

Before a student may change from one division to another he must obtain the approval of the dean of the division to which he wishes to transfer. Before a student may change from one curriculum to another in the same division he must obtain the approval of the dean of the division and the head of the curriculum to which he wishes to change.

MARKING SYSTEM: The following system is used by instructors in reporting marks to the Registrar: A, exceptionally high; B, superior; C, average; D, lowest passing mark; E, condition; F, failure; W, withheld X, dropped. For graduate students the lowest passing mark is C. The mark P may be used for undergraduate "Required" courses. Graduate students may also be given the mark P, pass, to indicate satisfactory progress in Research, Special Topics or "Required" courses.

QUALITY POINTS: For each credit earned, the student receives quality points, according to the mark attained as follows: A, 4 points; B, 3 points; C, 2 points; D, 1 point; E, and F, 0 points.
GRADUATION: A student intending to be graduated shall not be eligible if he lacks at the beginning of his last quarter more credits, not including "Conditions" or "Withhelds," than the number in which he would be entitled to classify as determined by his average for the preceding quarter. A student shall not have the privilege of removing "Conditions" or "Withhelds" or securing substitutions later than the middle of the quarter in which he is to be graduated. No credits will be accepted after this date for any courses except those included in the classification of the current quarter.

An average of at least 2 quality points per credit in all courses taken is required for graduation.

WITHDRAWAL FROM COLLEGE: If a student severs his connection with the college, he should report to his classifying dean. The college will refund the unused portion of the registration fee, deducting 10 percent for each week of attendance. No refund is made if the student has been in attendance six weeks or longer.

TRANSCRIPT OF RECORD: Any person who has attended college is entitled to one free transcript. A fee of $1 will be charged for each additional copy.

After a student has entered the college, records from other colleges that might have been submitted become a part of the student's permanent file and cannot be released, neither can these records be reproduced for transmittal elsewhere.

ENGLISH REQUIREMENTS: Skill in the use of the mother tongue is becoming more and more important. As a result, the college has adopted the policy of granting diplomas only to those students whose written and spoken use of the language measures up to a fair standard of clearness and accuracy. All students are required to take English composition throughout the freshman year and nearly all at least on course in speech subsequently. All seniors must pass an examination in English as a requirement for graduation. Graduate students are required to take a similar examination before registering for their second quarter's work in the Graduate College. Students who transfer from other colleges are required to take an examination in English; those who do not use the language clearly and correctly will be required to take remedial work in English without credit.

After students have completed their required English, they may receive advice and help in maintaining or increasing their skill in the use of the language from members of the Department of English and Speech who serve as the staff of the Writing Clinic, the services of which are available to all sophomores, juniors, seniors and graduate students. The Speech Clinic, maintained by the Department of English and Speech, is open to all students who wish advice concerning speech problems.

LIBRARY REQUIREMENTS: 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 the college requires all students to be given instruction and practice in how to locate the published literature of their respective major fields of study.

Freshman students receive instruction in the use of books and libraries as a part of their orientation work. Undergraduate students entering with advanced standing are required to take the course required of freshmen unless they have had comparable work elsewhere.

Examinations in Back Work

For matriculated students, examinations in back work will be conducted at the opening of the fall quarter, on Thursday and Friday of the week immediately preceding registration. Information as to the location of the examination may be obtained from the department office.

The examinations are scheduled as follows:

THURSDAY

8:00 A.M. to 10:00 A.M.
Engineering Drawing, Farm Crops, Physics, Poultry Husbandry, Zoology.

10:00 A.M. to 12:00 M.
Electrical Engineering, Civil Engineering, Mathematics, Forestry, Geology, Veterinary Medicine, Vocational Education.

1:00 P.M. to 3:00 P.M.
Chemical Engineering, Mechanical Engineering, Military, Landscape Architecture.

3:00 P.M. to 5:00 P.M.
Psychology, Government, History, Philosophy.
FRIDAY

8:00 A.M. to 10:00 A.M.

10:00 A.M. to 12:00 M.
Architectural Engineering, Botany, Dairy and Food Industries, Economics, English, Sociology.

1:00 P.M. to 3:00 P.M.
Technical Journalism, Genetics, Home Economics, Theoretical and Applied Mechanics, Speech.

3:00 P.M. to 5:00 P.M.
Agricultural Engineering, Modern Language, Bacteriology, Library, Soils.

For the winter and spring quarters see the college calendar for dates of these examinations.

Division of Agriculture

FLOYD ANDRE, Ph.D., Dean of Division of Agriculture
Curtiss Hall, Room 123N.

ROY M. KOTTMAN, Ph.D., Associate Dean
Curtiss Hall, Room 121.

The departments in the Division of Agriculture are: Agricultural Engineering (administered jointly with the Division of Engineering), Agronomy, Animal Husbandry, Dairy and Food Industries, Forestry, Genetics, Horticulture, Landscape Architecture, Plant Pathology, Poultry Husbandry, Technical Journalism, Vocational Education, Entomology and Wildlife, and Economics and Sociology (administered jointly with the Division of Science). The faculty of the division is made up of the members of all the departments within the division and representatives of the departments in other divisions whose work serves to prepare agriculture students for a better mastery of technical work in agriculture, and for assuming their roles of leadership and citizenship in our society.

PERSONNEL SERVICE. The agriculture division, through its placement office, supplements and coordinates the efforts made by the departments to establish definite contacts with those industries, commercial organizations, and federal and state agencies that employ men who have had technical training in any of the curricula in agriculture. The service includes the assistance given the members of each graduating class, the alumni and former students who desire to change positions, and the undergraduates who temporarily drop out of college or who seek agricultural or commercial experience during vacation periods.

HONOR SOCIETIES. There are two national honorary agricultural societies that have chapters at the Iowa State College—Alpha Zeta and Gamma Sigma Delta. They select their membership from all of the various curricula in the Division of Agriculture. Among the professional societies which limit their membership to students in specified curricula are Tau Sigma Delta, professional society in the fine arts, which selects its membership from the students in Landscape Architecture; Epsilon Pi Tau for students in Industrial Education; Sigma Delta Chi for students in Technical Journalism and a chapter of Phi Delta Kappa which elects its membership from students in Vocational Education, including both Agricultural Education and Industrial Education. Among the other honor societies open to students in the Division of Agriculture are:

- Sigma Xi .................. All College .......... Men and Women
- Phi Kappa Phi ............... All College .......... Men and Women
- Mortar Board ............... All College .......... Women
- Cardinal Key ................ All College .......... Men
- Phi Eta Sigma ............... All College .......... Men

CLUBS. Clubs and agricultural organizations include: Agricultural Business Club, Agricultural Education Club, Agricultural Journalism Club, Block and Bridle Club, Dairy Club, Dairy Cattle Club, Farm Operation Club, Forestry Club, Horticulture Club, Industrial Education Club, Iowa Student Branch of the American Society of Agricultural
Engineers, Poultry Club, Student Section of the American Society of Agronomy, Student Society of Landscape Architects and Rural Sociology Club.

AGRICULTURAL COUNCIL. The Agricultural Council is made up of representatives from all of the clubs listed above. The Council functions as a coordinating agency for various joint activities of the several clubs. In addition, the Agricultural Council sponsors the Harvest Ball, All-Ag Banquet and various other activities which are designed to foster the social and cultural development of all students in the Division of Agriculture. Members of the Council and students in Agriculture, appointed by the Council, serve on several faculty committees including: Career Days and Enrollment, Curriculum, Awards and Scholarships, Safety, Student Advising, Student-Faculty Relations, Visiting Groups and Alumni Fund Advisory Council.

Agricultural Scholarships

Applications for freshman scholarships, awards and aid funds made by students in the Division of Agriculture must be submitted by April 1. Applications for upperclassmen should be in by October 1.

Application blanks are available at the office of the Awards and Scholarships Committee, 121 Curtiss Hall.

ALCOA Agricultural Scholarships
For Freshmen.
Value: Five for $200 each.
Qualifications: Financial need, high scholarship, residents of Iowa.
Established in 1951 by the Aluminum Company of America.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

American Guernsey Cattle Club Scholarship
For Sophomores, Juniors or Seniors.
Value: Two for $250 each.
Qualifications: Must be majoring in Dairy Husbandry or show a distinct interest in the field. High scholastic standing is desirable.
Established in 1950 by the American Guernsey Cattle Club for students enrolled in agricultural colleges throughout the United States.
Apply to: Dairy Husbandry Department, 33 Curtiss Hall.

Des Moines Hoo-Hoo Club Forestry Scholarship
For a Sophomore.
Value: $200.
Qualifications: Must be a resident of Iowa who has completed three quarters of college work in forestry; financial need, scholarship, good character and personality; must give evidence of promise in the field of forestry.
Established in 1956 by the Des Moines Hoo-Hoo Club of Des Moines, Iowa.
Apply to: Forestry Department, 201 Curtiss Hall.

Donelson Scholarship
For Undergraduates.
Value: $100.
Qualifications: Students must be from small towns or rural communities from anywhere in the United States, enrolled in agriculture or home economics, in need of financial aid. Person selected should have shown in his or her freshman year average or above average ability.
Established in honor of V. Everett and Grace Miller Donelson, parents of Eva Donelson Wilson, a graduate of Iowa State College in home economics.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

Eli Lilly Advanced Curriculum Scholarships in Agriculture
For Sophomores.
Value: $600.
Qualifications: Must agree to follow a special curriculum prescribed by the Advanced Curriculum Committee; high scholarship, outstanding character and leadership.
Established in 1956 by Eli Lilly and Company, Indianapolis, Indiana.
No applications to be made.

**Farmers’ National Farm Management Scholarship**
For a Junior.
Value: $250.
Qualifications: Must be enrolled in Agricultural Business, Agricultural Education, Agronomy, Animal Husbandry, Dairy Husbandry or Farm Operation. Interest in and aptitude for farm management are essential.
Established in 1946 by the Farmers’ National Company of Omaha, Nebraska.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

**Federal Land Bank of Omaha Scholarships**
For Freshmen
Value: Two for $300 each.
Qualifications: Iowa farm boys of high character, in the upper one-third of their high school graduating class who have shown interest and aptitude in high school and community activities. Up to 10 extra points, on a scale totaling 100 points will be given to applicants who prepare a 300 word essay on the subject, “Influence of the Federal Land Bank and National Farm Loan Association in Improving Agriculture in My Community.” Established in 1953 by the Federal Land Bank of Omaha, Nebraska.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

**Industrial Education Scholarships**
For Undergraduates.
Value: One year’s tuition.
Qualifications: Must be registered at Iowa State College and shall have completed a minimum of three quarters of college work, two of which shall be major in Industrial Education. Financial need, scholarship, leadership, character.
Established in 1955 by alumni of the Industrial Education Department to give financial assistance to eligible members of the Industrial Education curriculum.
Apply to: The Department of Vocational Education, 220 Curtiss Hall.

**International Milling Company Scholarship**
For a Junior and a Senior.
Value: $300 each.
Qualifications: Scholarship, character, financial need and participation in activities of the college community; must be enrolled in Animal Husbandry, Dairy Husbandry or Poultry Husbandry.
Established in 1955 by the International Milling Company of Minneapolis, Minnesota.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

**Iowa Cream Quality Improvement Association Scholarships**
For Freshmen.
Value: $150.
Qualifications: Scholarship, character; interest and aptitude in high school and community activities. Must be enrolled in Dairy Industry curriculum.
Established in 1955 by the Iowa Cream Quality Improvement Association.
Apply to: Dairy and Food Industries Department.

**Iowa Master Farmers’ Club Scholarship**
For a Freshman.
Value: $200.
Qualifications: Must be an Iowa high school graduate, preferably with farm background. Selection is based on promise of ability in journalism; financial need; scholarship.
Established in 1955 by the Iowa Master Farmers’ Club for the study of Agricultural Journalism.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.
KLAU-VAN PIETERSOM-DUNLAP ADVERTISING AGENCY SCHOLARSHIP
For a Junior.
Value: $1,000.
Qualifications: Scholarship, proficiency and interest in advertising as a career.
Established in 1956 by the Kluu-Van Pietersom-Dunlap Advertising Agency in Milwaukee, Wisconsin. The student spends the summer between his junior and senior year working with the agency in Milwaukee.
Apply to: The Technical Journalism Department.

KNIGHTS OF AK-SAR-BEN SCHOLARSHIPS
For Freshmen.
Value: Eighteen for $100 each.
Qualifications: Scholarship, financial need, character, good record in school and community activities. Must be residents of Iowa counties from which livestock was exhibited at the Ak-Sar-Ben Livestock Show the previous year.
Established in 1952 by the Knights of Ak-Sar-Ben, Omaha, Nebraska, for freshmen enrolling in the Division of Agriculture.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

KNIGHTS OF AK-SAR-BEN SCHOLARSHIPS
For Sophomores.
Value: $300.
Qualifications: Financial need, scholarship. Must be from Iowa counties from which there were exhibitors at the Ak-Sar-Ben Livestock Show the previous fall. Winners of the freshman Ak-Sar-Ben Scholarships are automatically in competition for the sophomore awards.
Established in 1947 by the Knights of Ak-Sar-Ben, Omaha, Nebraska.
Administered by: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

MARKETING INDUSTRY SCHOLARSHIPS
For Freshmen.
Value: Six for $250 each.
Qualifications: Scholarship, leadership, character, financial need.
Established in 1954 by the Grain Marketing and Farm Supply Organizations of Iowa for students majoring in the Marketing Industries Option of the Agricultural Business curriculum.
Apply to: The Economics and Sociology Department, 207 Ag Annex.

MORTENSEN MEMORIAL DAIRY INDUSTRY SCHOLARSHIPS
For Freshmen.
Value: $300 each.
Qualifications: Scholarship, financial need, high moral character, active in high school and community affairs; must be registering for the first time as a student at Iowa State College in the Dairy Industry curriculum.
Established in 1955 by alumni and friends of the late Dr. M. Mortensen, formerly head of the Dairy Industry Department at Iowa State College.
Apply to: The Dairy and Food Industries Department.

POULTRY INDUSTRY SCHOLARSHIPS
For Freshmen and Transfer Students.
Value: Several for $225 each.
Qualifications: Scholarship, high moral character, financial need, promise of leadership; must be residents of Iowa registering for the first time as students at Iowa State College in the Poultry Husbandry curriculum, interested in preparing themselves to work in some branch of the poultry industry.
Established in 1945 by members of the Poultry Industry in Iowa.
Apply to: The Poultry Husbandry Department, 33 Curtiss Hall.
RALSTON PURINA COMPANY SENIOR SCHOLARSHIP
For a Senior.
Value: $500.
Qualifications: Scholarship, activities and citizenship, financial need; must be enrolled in Agricultural Business, Animal Husbandry, Dairy Husbandry, Poultry Husbandry, Technical Journalism, Agronomy, Farm Operation or Agricultural Education.
Established in 1955 by the Ralston Purina Company of St. Louis, Missouri.
No applications to be made.
Selected by the Awards and Scholarships Committee of the Division of Agriculture.

RATH PACKING COMPANY SCHOLARSHIPS
For Senior in Animal Husbandry.
Value: $500 for one or more.
Qualifications: One junior interested in hog buying and one junior interested in cattle buying may be selected for work in the Rath yards during the summer. If the students meet summer training requirements and other requirements of the Scholarship Committee, they are awarded scholarships for their senior year. Must be enrolled in Animal Husbandry.
Established in 1949 by the Rath Packing Company of Waterloo, Iowa.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

SEARS-ROEBUCK FOUNDATION SCHOLARSHIPS
For Freshmen.
Value: Twenty-two for $200 each.
Qualifications: Scholarship, financial need; boys who have shown an interest and aptitude in high school and community activities and have a deep interest in agriculture.
Established in 1936 by Sears-Roebuck Foundation.
Apply to: Awards and Scholarships Committee of the Division of Agriculture, 121 Curtiss Hall.

SEARS-ROEBUCK FOUNDATION 4-H POULTRY SCHOLARSHIP
For an Iowa 4-H student.
Value: $300.
Qualifications: Must have competed in a qualified county 4-H Laying Flock project and have exhibited at the Iowa State Fair. Final selection is based on 4-H project record book, quality of poultry exhibited, over-all 4-H activities and scholastic record.
Established in 1953 by Sears-Roebuck Foundation.
Apply to: Poultry Husbandry Department, 33 Curtiss Hall.

SMITH DOUGLAS COMPANY, INC., SCHOLARSHIPS
For Freshmen in Agronomy.
Value: Two for $1,000 each.
Qualifications: Must be rural male residents of Iowa; scholarship, financial need, high character; evidence of future leadership in agriculture; must have shown an interest and aptitude in high school and community activities. Preference will be given, although not limited, to boys who have had at least three years' active membership in either 4-H Club or FFA. To be eligible to continue receiving the scholarship during sophomore, junior and senior years, the recipient must earn a scholastic average sufficiently high to rank in the upper one-third of his class in the curriculum in Agronomy.
Apply to: The Department of Agronomy.

C. Y. STEPHENS DAIRY INDUSTRY SCHOLARSHIPS
For Freshmen in Dairy Industry.
Value: Two for $300 each.
Qualifications: High moral character, scholarship, interest and aptitude in high school and community activities; must be registering for the first time in the Dairy Industry curriculum.
Apply to: The Dairy and Food Industries Department. Applications received until April 1.

C. Y. Stephens Dairy Industry Scholarships
For Juniors and Seniors in Dairy Industry.
Value: Four for $150 each.
Qualifications: Scholarship, financial need.
Established in 1936 by C. Y. Stephens of Washington, D. C., an Iowa State College graduate.
Apply to: The Dairy and Food Industries Department.

WMT Farm Radio Scholarship
For a Junior.
Value: $1,000.
Qualifications: Aptitude in farm radio journalism and interest in such a career.
Established in 1946 by Radio and TV Stations WMT in Cedar Rapids, Iowa. To be paid to a selected junior for full-time work as assistant farm editor three months of the summer following his junior year and for part-time service as campus correspondent for WMT during his senior year.
Apply to: The Technical Journalism Department.

Agricultural Awards

American Society of Landscape Architects Certificate of Merit Award
For a Senior.
Value: A certificate.
Qualifications: Scholarship; general excellence in landscape design.

Borden Agricultural Award
For a Senior.
Value: $300.
Qualifications: Highest grades of all other similarly eligible students in all preceding college work; must include two or more dairy courses in the curriculum.
Established in 1945 by the Borden Company.

Danforth Summer Fellowship Award
For a Junior.
Value: Two weeks in St. Louis, Missouri, visiting research laboratories and farms of the Ralston Purina Company, and two additional weeks at the American Youth Foundation Camp, Shelby, Michigan.
Qualifications: Most outstanding in balanced physical, mental, social and religious development.
Established in 1929 by the Ralston Purina Company.

Danforth Leadership Training Award
For a Freshman.
Value: Two weeks of leadership training at the American Youth Foundation Camp, Shelby, Michigan.
Qualifications: Most outstanding in balanced physical, mental, social and religious development.
Established in 1935 by the Ralston Purina Company.

Chicago Farmers' Club Award
For a Senior.
Value: $100.
Qualifications: Scholarship, financial need; extracurricular activities, indicating the individual's leadership ability.
Established in 1954 by the Chicago Farmers' Club for a student entering his senior year of study in the Division of Agriculture.
DIVISIONS

FEDERATED GARDEN CLUBS OF IOWA AWARD
For Undergraduates.
Value: $75.
Qualifications: Ability, academic achievement, character; interest in affairs worthy of horticulturists. Must have completed five quarters of work.
Established in 1950 by the Federated Garden Clubs of Iowa.

WILLIAM C. BRYANT AWARD
For Livestock Judging Teams.
Value: Varies.
Qualifications: Membership on one of the Animal Husbandry Livestock Judging teams.

GEORGE FREEMAN MEMORIAL AWARD
For Juniors, Seniors or Graduate students.
Value: $50.
Qualifications: Must be enrolled as a minor or major in General or Rural Sociology, having completed a minimum of twelve hours in sociology at Iowa State College. Scholarship; actual or potential leadership ability in the field of sociology.
Established in 1956 through Alpha Kappa Delta, Sociology Honorary, as a memorial to George Freeman, an outstanding sociology instructor from 1949 to 1953.

GEORGE GUND ANIMAL HUSBANDRY AWARDS
For Seniors.
Value: Five for $300 each.
Qualifications: Scholarship, character, initiative.
Established in 1936 by George Gund of the Gund Realty Company, Cleveland, Ohio.

WILLIAM J. HUGHES MEMORIAL AWARD
For a Senior.
Value: About $50.
Qualifications: Must have been at Iowa State College for at least four quarters in horticulture. Leadership, scholarship, character.
Established in 1955 in memory of William J. Hughes.

IOWA AGRICULTURAL LIMESTONE AWARD
For a Senior.
Value: $200.
Qualifications: Scholarship, character, financial need, residence in Iowa; an interest in agronomic pursuits.
Established in 1950 by the Iowa Agricultural Limestone Association.

IOWA CROP IMPROVEMENT ASSOCIATION AWARD
For a Junior.
Value: $200.
Qualifications: Scholarship, character, leadership, participation in extracurricular activities; financial need. Established in 1955 by the Iowa Crop Improvement Association.

KEITH CRANSTON FORESTRY PRIZE
For a Senior.
Value: An engraved compass.
Qualifications: Ability, leadership, scholarship.
Established in 1956.

JOHN MORRELL & COMPANY AWARD
For Undergraduates.
Value: Four awards of $25 each.
Qualifications: Must be members of the meats judging team.
Established in 1945 by John Morrell & Company.

NATIONAL PLANT FOOD INSTITUTE AWARD
For a Sophomore.
Value: $200.
Qualifications: Scholarship, character, activity in extracurricular affairs, including participation in the Agronomy Club; must be classified as a sophomore in agronomy.
-established in 1956 by the national plant food institute.

Charles Lathrop Pack Permanent Forestry Prize
For Undergraduates.
Value: First prize, $50; second prize, $25; third prize, $15.
Qualifications: Best essays submitted on forestry subjects.
Established in 1925 by Charles Lathrop Pack, former president of the American Tree Association, for the purpose of encouraging technical forestry students to develop ability in writing and speaking.

Sears-Roebuck Foundation Agricultural Award
For a Sophomore.
Value: $250.
Qualifications: Highest scholarship rating among the previous year’s group of freshman Sears-Roebuck scholarship winners.
Established in 1937 by the Sears-Roebuck Foundation.

Society of American Foresters Award
For Seniors.
Value: Initiation fee and dues for one year for two junior memberships in the Society of American Foresters.
Qualifications: Scholarship, attitude, leadership. Must be enrolled in the Forest Management or the Wood Utilization Options.
Established in 1953 by the Iowa Chapter of the American Foresters Society.

Paul P. Stewart Memorial Award
For a Sophomore, Junior or Senior.
Value: Varies but is usually about $400.
Qualifications: Scholarship, character, financial need, promise of leadership. Interest in dairy cattle, primarily the Holstein breed.
Established in 1950 by dairymen and other friends of the late Paul P. Stewart, outstanding Holstein-Friesian breeder in Maynard, Iowa.

George H. Walker Award
For a Senior.
Value: $35.
Qualifications: Dairy Industry or Dairy Husbandry student who has made outstanding progress in the study of milk.

Zimmerman Memorial Prize
For a Junior.
Value: $20.
Qualifications: Horticulture junior having the best record in scholarship, character, initiative.

Loan Funds. Students majoring in Animal Husbandry may obtain assistance from the Pullman Loan Fund. Other students are eligible for assistance from loan funds administered by the Director of Student Loans.

Publications. The students in the Division of Agriculture, under the general supervision and direction of the Department of Technical Journalism, publish a monthly journal known as The Agriculturist. The publication has taken high rank in its class and affords students an opportunity to get practical training and experience in agricultural writing. In addition, much of the meritorious work of advanced students in agricultural journalism is used by the agricultural press and by daily and weekly papers. The Ames Forester is an annual published by the Forestry Club. The students, with the assistance of the alumni working in the field, have made this an attractive publication of a technical character. Horizons is a quarterly magazine published by the students of the Department of Landscape Architecture.

Curricula in Agriculture
The course work offered in agriculture at Iowa State College is based upon the latest findings made available through research and experimental work. Because the teaching program is continually kept up to date, the demand for men and women educated in agriculture at Iowa State College is great. There is every reason to expect that in
the years ahead the need for well-trained people in the agricultural industries will continue or even become greater. Farming has become a very complex enterprise and the value of a thorough understanding of the basic scientific concepts related to agriculture has been demonstrated again and again.

At Iowa State College opportunity is given for students to specialize in some phase of agriculture, such as the four-year programs in Agricultural Business, Rural Sociology, Agricultural Education, Agricultural Journalism, Agricultural Engineering, Agronomy, Animal Husbandry, Dairy Husbandry, Dairy and Food Industries, Farm Operation, Forestry, Horticulture, Industrial Education, Landscape Architecture, and Poultry Husbandry. In addition special, non-degree programs are offered in Agricultural Business, Dairy Plant Operation, Farm Operation and Horticulture. For preparation for work in the Agricultural Extension Service, see page 58. For preparation for graduate study or for training in Foreign Trade and Service, see page 59. For these instances of training in agriculture with special objectives, a general background in agriculture is emphasized so that, regardless of the occupation the student eventually enters, he will have a broad understanding of the basic elements of agriculture. The main purpose of all curricula in the Division of Agriculture is to prepare men and women to serve better the needs of agriculture.

In addition to providing specialized and general backgrounds in agriculture, each of the curricula includes courses in the basic physical, biological, and social sciences, with sufficient English, literature, and history to broaden the student culturally and to make him proficient in serving his fellow men. The fact that many of our graduates have made outstanding records in farming, in the agricultural industries and in other work demonstrates the value of such education.

The occupational objectives of collegiate instruction in agriculture are to prepare young people to enter commercial work in the agricultural industries; to become farmers or farm managers, teachers in high schools and colleges, research workers in state and federal agencies, privately endowed institutions and in industry, extension specialists, county extension directors or extension assistants in youth work, consultants on agricultural problems and to provide agricultural background for students entering other professional or commercial fields.

The curricula provided in agriculture afford the student an opportunity to study that phase of agriculture in which he is most interested and for which he is best suited. Federal funds and annual appropriations of state funds for research, extension, and instruction in agriculture and related sciences enable the staff to make effective use of the experimental fields, barns, processing plants, gardens and orchards as laboratories for practical investigation, as well as for instructional purposes.

Curriculum in Agricultural Business

With specialization in Farm Management, Marketing Industries, Public Service and Administration or Agricultural Economics.

The curriculum is administered through the Department of Economics and Sociology and leads to the degree of Bachelor of Science.

Six months of practical work approved by the Department is required before graduation. Students in the Marketing Industries Option ordinarily will be encouraged to complete supervised training in the employ of an agricultural business.

Those students who complete at least 96 credits, with at least a "C" average, and who find it impractical to complete the four-year program will receive a certificate showing completion of the first two years of the program.

A student can prepare for the study of law by completion of three years of study under the agricultural business curriculum followed by one year in a recognized law college after which the degree of Bachelor of Science in Agriculture will be awarded by Iowa State College.

The following options within the Agricultural Business curriculum provide training in agriculture, in the natural and social sciences and in the particular economic field in which the student is primarily interested. Each specialization provides for electives to permit the student to select technical courses needed for his own employment objective.
1. Farm Management.
For those students interested in farming, professional farm management, farm credit, banking, appraisal, extension, insurance, soil conservation planning and other advisory services to farmers.

For those students interested in entering the various agricultural marketing, processing, distributive and farm supply businesses which serve agriculture. Students interested in farm machinery, and equipment merchandising and service will be allowed to substitute specified courses in agricultural engineering.

3. Public Service and Administration.
For those students interested in positions with various governmental agencies at the federal, state or county levels, and also for those interested in positions with farm magazines, newspapers, radio stations, farm organizations or foreign agricultural services which require a basic knowledge of the business side of agriculture.

4. Agricultural Economics.
For those students interested in positions as professional agricultural economists either in public or in private employment, and for those interested in post-graduate study in any of the above three specializations.

### Fall Quarter Credits
- Prin. of Crop Production
- Agron. 114
- Introd. Ag. Economics
- Ec. 121
- Prin. of Composition
- Engl. 101
- Math. for Ag. Students
- Math. 100
- Military Science

Total: 15

### Winter Quarter Credits
- Elements of Livestock Production
- Agron. 114
- General Chemistry
- Chem. 101
- Elements of Farm Mgt.
- Ec. 130B
- Prin. of Composition
- Engl. 102
- General Psychology
- Psych. 104
- Military Science

Total: 17

### Spring Quarter Credits
- General Botany
- Bot. 101
- General Chemistry
- Chem. 102
- Agricultural Marketing
- Ec. 135
- Prin. of Composition
- Engl. 103
- Military Science
- Electives

Total: 18

A student will be required to complete the courses listed below under his selected option in addition to those listed above.

### Farm Management
- Zool. 109

### Marketing Industries
- I. Ad. 372C

### Agricultural Economics
- Math. 112

### Public Service and Administration
- Zool. 109

In addition to the courses listed each student will be required to include in his freshman and sophomore years, Ec. 110, Ag. 101, 104, Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212.)

Math. 101 may be substituted for Math. 100 by any student, but students electing the Agricultural Economics option will be required to obtain credit in Math. 101.

### Sophomore Year

#### Winter Quarter Credits
- Prin. of Economics
- Ec. 241
- General Genetics
- Gen. 300
- Agricultural Physics
- Phys. 204
- Introd. to Sociology
- Soc. 134
- Military Science
- Electives

Total: 17

#### Spring Quarter Credits
- Soils
- Agron. 154
- Agron. Economics
- Ec. 242
- Milinary Science
- Electives
- Electives
- Electives

Total: 18

A student will be required to complete the courses listed below under his selected option in addition to those listed above.

### Farm Management
- A.E. 289

### Marketing Industries
- Ec. 292, 305

### Agricultural Economics
- I. Ad. 365

### Public Service and Administration
- Zool. 225

Certificate students may substitute not more than 12 credits of Ec. 190 for courses listed in Fall Quarter, Sophomore year.
<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
</tr>
<tr>
<td><strong>Organic Chemistry</strong> Chem. 231</td>
<td>5</td>
<td><strong>Fundamentals of Animal Nutrition</strong> A.H. 318</td>
</tr>
<tr>
<td><strong>Money &amp; Banking</strong> Ec. 304</td>
<td>3</td>
<td><strong>Prices &amp; Resource Allocation</strong> A.H. 318</td>
</tr>
<tr>
<td><strong>Speech-Making</strong> Sp. 311</td>
<td>3</td>
<td><strong>Prices &amp; Resource Allocation</strong> A.H. 318</td>
</tr>
<tr>
<td><strong>Electives</strong></td>
<td>6</td>
<td><strong>Electives</strong></td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>16</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

A student will be required to complete the courses listed below under his selected option in addition to those listed above.

**Farm Management**
- Agron. 306, 384
- Agron. 354
- A.H. 254
- Ec. 350, 331, 334

**Marketing Industries**
- Bact. 200
- I.E. 351
- Stat. 201

**Agricultural Economics**
- Agron. 354
- Ec. 334
- I.A. 384
- Soc. 335 or 336
- or 386
- Stat. 201

**Public Service and Administration**
- A.E. 306
- A.H. 319
- Ec. 330, 331, 334
- Stat. 201

**Senior Year**

<table>
<thead>
<tr>
<th><strong>Credits</strong></th>
<th><strong>Credits</strong></th>
<th><strong>Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electives</strong></td>
<td>17</td>
<td><strong>Public Finance and Fiscal Policy</strong> Ec. 405</td>
</tr>
<tr>
<td><strong>Electives</strong></td>
<td>13</td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

A student will be required to complete the courses listed below under his selected option in addition to those listed above.

**Curriculum in Rural Sociology**

Administered by the Department of Economics and Sociology.

Leading to the degree of Bachelor of Science.

Six months of practical work approved by the department is required before graduation.

**Freshman Year**

<table>
<thead>
<tr>
<th><strong>Credits</strong></th>
<th><strong>Credits</strong></th>
<th><strong>Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gen. Botany</strong> Bot. 101</td>
<td>3</td>
<td><strong>Crop Production and Mgt.</strong> Agron. 114</td>
</tr>
<tr>
<td><strong>Prin. of Composition</strong> Engl. 101</td>
<td>3</td>
<td><strong>Intro. to Sociology</strong> Soci. 134</td>
</tr>
<tr>
<td><strong>Livestock Problems</strong> A.H. 111</td>
<td>3</td>
<td><strong>Prin. of Composition</strong> Engl. 102</td>
</tr>
<tr>
<td><strong>Rural Institutions and Organizations</strong> Soc. 200</td>
<td>4</td>
<td><strong>General Chemistry</strong> Chem. 101</td>
</tr>
<tr>
<td><strong>Animal Biology</strong> Zool. 109</td>
<td>4</td>
<td><strong>Prin. of Economics</strong> Econ. 241</td>
</tr>
<tr>
<td><strong>Military Science</strong></td>
<td>1</td>
<td><strong>Military Science</strong></td>
</tr>
<tr>
<td><strong>18</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: Ec. 110; Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Phys. Ed. for Men, page 212.)

**Sophomore Year**

<table>
<thead>
<tr>
<th><strong>Credits</strong></th>
<th><strong>Credits</strong></th>
<th><strong>Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Problems</strong> Soc. 135</td>
<td>3</td>
<td><strong>Juvenile Delinquency</strong> Soc. 336</td>
</tr>
<tr>
<td><strong>College Algebra</strong> Math. 101</td>
<td>5</td>
<td><strong>Soils</strong> Agron. 154</td>
</tr>
<tr>
<td><strong>Prin. of Economics</strong> Econ. 243</td>
<td>3</td>
<td><strong>Grain Crops</strong> Agron. 214</td>
</tr>
<tr>
<td><strong>Organic Chemistry</strong> Chem. 231</td>
<td>5</td>
<td><strong>Fundamentals of Nutrition</strong> A.H. 318</td>
</tr>
<tr>
<td><strong>Military Science</strong></td>
<td>1</td>
<td><strong>Electives</strong></td>
</tr>
<tr>
<td><strong>Military Science</strong></td>
<td>1</td>
<td><strong>Military Science</strong></td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>18</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Group Work Techniques and Programs
- Agron. 354
- Forage Crops
- Agron. 234
- Soc. 364
- Publicity Methods
- T.I. 225
- Military Science
- T.I. 225
Junior and Senior Years

1. A minimum of ninety-seven credits is required to complete the junior and senior years. Most of the courses will be senior college rank. The student has the opportunity to select courses which will provide training for the field of his major interest.

2. During the last quarter of the sophomore year or early in the junior year, a complete program will be worked out by the student in conference with the adviser, subject to the approval of the Dean of Agriculture. Duplicate copies will be filed in the dean's office and in the office of the Registrar.

3. A minimum of thirty credits shall be chosen from courses in Rural Sociology and related subjects, fifteen credits in General Sociology, fifteen credits of other social subjects such as history, government, psychology, political science and thirty-seven credits of free electives of which at least nine credits must be in technical agriculture. The curriculum in Rural Sociology provides an opportunity for students to specialize in:

   a. Rural Administration, which prepares rural sociologists for positions with agricultural organizations and government agencies, including Agriculture Extension, public relations, foreign agricultural service (agricultural missions, rural welfare and group work).

   b. Pre-graduate study in preparation for advanced systematic training in sociology and rural sociology.

Students in this curriculum may take in their junior and senior years such courses as Soc. 300, 335, 386, 387, 406, 409, 419, 454A, 464, 485, 486; Ec. 304, 330, 334, 336, 455; Hist. 334, 335, 490; Govt. 315, 485, 490; V.Ed. 204, 305, 467, 537; Engl. 205, 254; Sp. 301, 311; Psych. 254, 340; Phys. 204; Bact. 200; L.A. 350; Gen. 400 and approximately fifteen hours in agriculture and biological sciences related to their vocational objectives.

When the student has chosen his vocational objective he should consult with his adviser to make appropriate changes in his program.

Curriculum in Agricultural Education

Administered by the Department of Vocational Education.

Leading to the degree of Bachelor of Science.

Six months of practical work approved by the department is required before graduation. Two calendar years of farm experience after the age of fourteen are required of those who want to qualify to teach vocational agriculture.

For description of courses in agricultural education, see page 241.

Fall Quarter | Credits | Winter Quarter | Credits | Spring Quarter | Credits
--- | --- | --- | --- | --- | ---
Livestock Problems | 3 | A.H. III | A.E. 254 | 2 | Farm Carpentry | 2
Prin. of Composition | 3 | Engl. 101 | Prin. of Crop Production | 3 | A.H. 112 | 3
General Horticulture | 3 | Hort. 114 | Agron. 114 | 3 | Prin. of Composition | 3
Drawing for Teachers of Agr. I.Ed. 154 | 2 | Zool. 109 | General Botany | 3 | Engl. 103 | 3
Animal Biology | 4 | Military Science | Elements of Dairy & Food Industries | 4 | 1Ag. Mathematics | 5
Zool. 109 | 4 | | D.F.I. 114 | | Math. 100 | 5
Military Science | 1 | | Eng. 102 | | General Poultry Husbandry | 1
| 16 | | Military Science | 16 | P.H. 101 | 17

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: V.Ed. 110; Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212.)

1 Students presenting 1½ units of high school algebra should take Math. 101.
DIVISIONS

Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>Forage Crops</td>
<td>4</td>
</tr>
<tr>
<td>Agron. 284</td>
<td></td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Agron. 102</td>
<td></td>
</tr>
<tr>
<td>Chem. 101</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Ec. 242</td>
<td></td>
</tr>
<tr>
<td>Phys. 204</td>
<td></td>
</tr>
<tr>
<td>Survey of Ag. Education</td>
<td>1</td>
</tr>
<tr>
<td>V.Ed. 211A</td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
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</tr>
<tr>
<td>Electives</td>
<td>4</td>
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<tr>
<td>Total Credits</td>
<td>17</td>
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Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td></td>
</tr>
<tr>
<td>Agron. 154</td>
<td>4</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>Chem. 231</td>
<td>5</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Ec. 243</td>
<td></td>
</tr>
<tr>
<td>Principles of Education</td>
<td>3</td>
</tr>
<tr>
<td>V.Ed. 204</td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td>Total Credits</td>
<td>18</td>
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</tbody>
</table>

Sophomore Year

Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
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</tr>
<tr>
<td>Chem. 102</td>
<td></td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Ec. 242</td>
<td></td>
</tr>
<tr>
<td>Ag. Physics</td>
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</tr>
<tr>
<td>Phys. 204</td>
<td></td>
</tr>
<tr>
<td>Publicity Methods</td>
<td>3</td>
</tr>
<tr>
<td>T.I. 225</td>
<td></td>
</tr>
<tr>
<td>General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 104</td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td>Total Credits</td>
<td>17</td>
</tr>
</tbody>
</table>

Junior and Senior Years

1. The junior and senior years will cover a minimum of 101 credits, and will be planned to carry forward and expand the field of the student's major study as represented by the option chosen at the end of the sophomore year. A foundational or advanced systematic sequence of science or social studies may be chosen for the student's minor, non-agricultural teaching fields. During the last quarter of the sophomore year or early in the junior year, a complete program will be worked out by the student in conference with the head of the major department, subject to the approval of the Dean of Agriculture. Duplicate copies will be filed in the dean's office and in the office of the Registrar.

2. The subjects making up the junior and senior years must ordinarily be of 300 and 400 courses.

Special Requirements

1. A list of the courses required of students qualifying to teach vocational agriculture is on file in the Department of Vocational Education. These courses include a minimum of eighteen credits in each of the following fields: agronomy, animal husbandry, agricultural engineering, and economics and sociology. This minimum is exceeded in most cases and is supplemented by courses in dairy industry, forestry, horticulture, and landscape architecture. In addition, supporting subjects from the Division of Science are included in order to develop the major field more adequately and to meet course prerequisites.

2. Professional courses in education and psychology must be taken to qualify for a teacher's certificate. The following courses are required for the Professional Certificate: V.Ed. 204, 305, 426; Psych. 104, 234 and 334; Govt. 315, Sp. 311. Supervised student teaching, V.Ed. 425, plus V.Ed. 211, 321, 423 and 424 are required for those preparing to teach vocational agriculture. The following courses are recommended to strengthen the professional preparation of prospective teachers: V.Ed. 533, 534, 538 and 550.

Pre-Graduate Training

Students interested in graduate training in agricultural education should consult with the adviser and the head of the department, preferably as early as the beginning of the sophomore year. A modified curriculum will be outlined, subject to the approval of the classifying officer, to meet the individual needs of the student in preparation for graduate study.

Curriculum in Agricultural Engineering

Administered jointly by the Division of Agriculture and the Division of Engineering, see page 68.

Curriculum in Agricultural Journalism

Administered by the Department of Technical Journalism.

Leading to the degree of Bachelor of Science.

Students are required to spend the summer following their sophomore year in practical farm work on an approved farm and to spend the summer following their junior year in practical work with some radio station or farm publication.

There shall be a total of 15 credits of electives taken in one major line of agriculture, and an additional 6 credits in history and/or government.
### Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock Problems A.H. 111</td>
<td>3</td>
</tr>
<tr>
<td>General Botany Bot. 101</td>
<td>3</td>
</tr>
<tr>
<td>Prin. of Composition Engl. 101</td>
<td>3</td>
</tr>
<tr>
<td>General Horticulture Hort. 114</td>
<td>3</td>
</tr>
<tr>
<td>Ag. Mathematics Math. 100 or 101</td>
<td>5</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
</tbody>
</table>

### Freshman Year

#### Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 101</td>
<td></td>
</tr>
<tr>
<td>Elements of Dairy &amp; Food Industries</td>
<td>4</td>
</tr>
<tr>
<td>D.F.I. 114</td>
<td></td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 102</td>
<td></td>
</tr>
<tr>
<td>Gen. Poult. Husbandry</td>
<td>3</td>
</tr>
<tr>
<td>P.H. 101</td>
<td></td>
</tr>
<tr>
<td>Intro. to Sociology</td>
<td>1</td>
</tr>
<tr>
<td>Soc. 104</td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
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</tbody>
</table>

#### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prin. of Crop Production Agron. 114</td>
<td>3</td>
</tr>
<tr>
<td>Livestock Problems A.H. 112</td>
<td>3</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 102</td>
<td></td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 102</td>
<td></td>
</tr>
<tr>
<td>Journalistic Vocations</td>
<td>2</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

In addition to the courses listed, each student will be required to include in his freshman and sophomore years T.J.I. 110; Ag. 101, 104; Libr. 106A and six quarters of physical education (see Physical Education for Men, page 212).

*Students with 1½ units of high school algebra may take Math. 101.*

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>4</td>
</tr>
<tr>
<td>Agron. 154</td>
<td></td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Ec. 241</td>
<td></td>
</tr>
<tr>
<td>Hist. of American Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 302</td>
<td></td>
</tr>
<tr>
<td>Prin. of Radio and Telev. Broadcasting</td>
<td>3</td>
</tr>
<tr>
<td>Sp. 301</td>
<td></td>
</tr>
<tr>
<td>Technical Reporting</td>
<td>4</td>
</tr>
<tr>
<td>T.J.I. 222</td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Mach. &amp; Power Mgt. A.E. 334</td>
<td>4</td>
</tr>
<tr>
<td>General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Gen. 300</td>
<td></td>
</tr>
<tr>
<td>Technical Advertising T.J.I. 325</td>
<td>3</td>
</tr>
<tr>
<td>Copy Editing &amp; Tyog. T.J.I. 341</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>T.J.I. 427</td>
<td></td>
</tr>
<tr>
<td>Low of Communications</td>
<td>3</td>
</tr>
<tr>
<td>T.J.I. 430</td>
<td></td>
</tr>
<tr>
<td>Radio &amp; Television News T.J.I. 481</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
</tbody>
</table>

### Elective courses are suggested as indicated for the four fields of specialization below:

2. Agricultural Writing: A.H. 216; Ec. 307, 334 or 430; Engl. 250, 334 or 364.

### Curriculum in Agronomy

Leading to the degree of Bachelor of Science.

With options in Soils and Crop Production or Agronomic Science. Students in soils and crop production will be trained for positions which require a broad knowledge of agriculture. They may specialize in one or more of the following areas: seed production, crop improvement, fertilizer technology, soil conservation, soil survey and Agronomic Extension. The electives will be taken not only in agronomy and closely-related fields of agriculture, but also in the sciences and humanities.
Students in agronomic science will be trained for positions as technical specialists or scientists in public or private employment. With selection of appropriate electives, these students will be prepared for post-graduate study in farm crops, soils or agricultural climatology. They will take additional training in the basic sciences.

Completion of 200 credit hours in either of the above areas may lead to the degree of Bachelor of Science.

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prin. of Crop Prod. Agron. 114</td>
<td>General Chemistry Chem. 101</td>
<td>Soils Agron. 154</td>
</tr>
<tr>
<td>Livestock Problems A.H. 111</td>
<td>Prin. of Composition Eng. 102</td>
<td>Livestock Problems Agron. 112</td>
</tr>
<tr>
<td>Prin. of Composition Eng. 101</td>
<td>Military Science</td>
<td>General Chemistry Chem. 102</td>
</tr>
<tr>
<td>Ag. Mathematics Math. 100</td>
<td></td>
<td>Military Science</td>
</tr>
<tr>
<td>or College Algebra Math. 101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to the courses listed each student will be required to include in his freshman and sophomore years: Agron. 110; Agron. 101, 104; Libr. 106A and six quarters of physical education (see Physical Education for Men, page 212). The student will also be required to take the following courses in his selected option:

**Soils and Crop Prod. Option**

General Botany Bot. 101 (Winter) 3
The Plant Kingdom Bot. 102 (Spring) 3
Prin. of Composition Eng. 103 3
General Horticulture Hort. 114 3
Intro. to Sociology Soc. 194 3

**Agricultural Meteorology**

Agron. 206 3
Qualitative Analysis Chem. 103 4
Prin. of Economics Ec. 241 3
Military Science 1

**Agronomic Science Option**

General Botany Bot. 101 (Fall) 3
The Plant Kingdom Bot. 102 (Winter) 3
Plane Trigonometry Math. 102 5
Analytical Geometry Math. 103 5

**Sophomore Year**

Agron. 214 4
Grain Crops Agron. 214 4
Prin. of Economics Ec. 242 3
Forage Crops Agron. 234 4
Prin. of Economics Ec. 243 3
Military Science 1

**Agronomic Science Option**

Quantitative Analysis Chem. 211 4
Organic Chemistry Chem. 334 3 or 4
Organic Chemistry Chem. 335 3 or 4
Prin. of Composition Eng. 103 3
Publicity Methods T.JI. 225 (Fall) 3

**Junior Year**

Seminar Agron. 311 1
Prin. of Plant Pathology Bot. 407 4
Seminar Agron. 351 1
General Genetics Gen. 300 3
General Bacteriology Bact. 304A 5
Farm Insects Zool. 374 4
Elementary Plant Physiology Bot. 205 4
Hist. 324 3

In addition to the above courses, a student will be required to take the following courses in his selected option:
ANIMAL HUSBANDRY

<table>
<thead>
<tr>
<th>Solids and Crop Prod. Option</th>
<th>Credits</th>
<th>Agronomic Science Option</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fundamentals of Nutrition</strong></td>
<td><strong>3</strong></td>
<td><strong>Plant Propagation</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>A.H. 318</td>
<td></td>
<td>Hort. 214</td>
<td></td>
</tr>
<tr>
<td>Agricultural Physics</td>
<td><strong>3</strong></td>
<td>General Physics</td>
<td><strong>4 or 5</strong></td>
</tr>
<tr>
<td>Phys. 204</td>
<td></td>
<td>Phys. 211</td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td><strong>13</strong></td>
<td>General Physics</td>
<td><strong>4 or 5</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phys. 212</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Physics</td>
<td><strong>4 or 5</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phys. 213</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Psychology</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psych. 104</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speech-Making</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sp. 311</td>
<td></td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prin. of Crop Breeding</td>
<td>Seminar Agron. 411</td>
<td>1</td>
</tr>
<tr>
<td>Agron. 424</td>
<td></td>
<td>American Government Govt. 315</td>
</tr>
<tr>
<td>Soil Conservation &amp; Erosion Control</td>
<td>Seminar Agron. 451</td>
<td>1</td>
</tr>
<tr>
<td>Agron. 464</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to the above courses, a student will be required to take the following courses in his selected option:

<table>
<thead>
<tr>
<th>Solids and Crop Production Option</th>
<th>Credits</th>
<th>Agronomic Science Option</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil and Water Conservation</strong></td>
<td><strong>3</strong></td>
<td><strong>Fundamentals of Nutrition</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>A.E. 305</td>
<td></td>
<td>A.H. 318</td>
<td></td>
</tr>
<tr>
<td>Crop Management</td>
<td><strong>3</strong></td>
<td>Ag. Geology</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Agron. 414</td>
<td></td>
<td>Geol. 375</td>
<td></td>
</tr>
<tr>
<td>Soil Management</td>
<td><strong>3</strong></td>
<td>Introd. to Sociology</td>
<td><strong>24</strong></td>
</tr>
<tr>
<td>Agron. 454</td>
<td></td>
<td>Soc. 134</td>
<td></td>
</tr>
<tr>
<td>Livestock Production</td>
<td><strong>3</strong></td>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>A.H. 415</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock Production</td>
<td><strong>3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.H. 416</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td><strong>23</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Suggested Electives for Specialized Training:

**Commercial Seed Production, Processing and Distribution:**
Agron. 317, 415, 505; Bot. 204, 206, 216, 338, 438; Ec. 135; I.Ad. 365C.

**Fertilizer Utilization, Distribution and Technology:**
Agron. 434, 453, 553, 565; Ec. 135, 330; I.Ad. 365C.

**Soil Conservation Technology:**
Agron. 454, 565, 575, 577; Ec. 330; 334, 430; For. 220.

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agron. 505</td>
<td>Chem. 321, 322</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Bot. 204, 206</td>
<td>Geol. 355</td>
<td></td>
</tr>
<tr>
<td>Gen. 305</td>
<td>Math. 211, 212</td>
<td></td>
</tr>
<tr>
<td>Math. 211, 212</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Crops:**
Agron. 317, 318, 415, 505; Bot. 204, 206, 216, 338, 438; Ec. 135; I.Ad. 365C.

**Solids:**
Agron. 154, 317, 415, 505; Bot. 204, 206, 216, 338, 438; Ec. 135; I.Ad.

**Ag. Climatology:**
Agron. 154, 317, 415, 505; Bot. 204, 206, 216, 338, 438; Ec. 135; I.Ad.

**Soil Conservation Technology:**
Agron. 434, 453, 553, 565; Ec. 135, 330; I.Ad. 365C.

**Extension Education:**
Agron. 434, 453, 553; Bot. 216. (See statement on training for Extension Service, page 58.)

For pre-graduate training students should follow the Agronomic Science Option.

In addition the following courses are suggested for additional electives or for substitution:

**Crops:**
Agron. 505; Bot. 204, 206; Gen. 305; Math. 211, 212

**Soils:**
Chem. 321, 322; Geol. 355; Math. 211, 212

**Ag. Climatology:**
Stat. 201; Phys. 305, 306; Math. 211, 212

Students interested in preparing for graduate study in any of the three major fields should consult with the head of the department as early in their college work as possible—preferably by the beginning of the sophomore year.

Curriculum in Animal Husbandry

Leading to the degree of Bachelor of Science.

Six months of practical work approved by the department is required before graduation.

**Freshman Year**

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prin. of Crop Production</td>
<td>Agron. 114</td>
<td><em>Livestock Problems</em></td>
</tr>
<tr>
<td>Agron. 114</td>
<td>A.H. 115</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Livestock Problems</td>
<td><strong>3</strong></td>
<td>General Botany</td>
</tr>
<tr>
<td>A.H. 111</td>
<td>Bot. 101</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Livestock Management</td>
<td><strong>2</strong></td>
<td>Prin. of Composition</td>
</tr>
<tr>
<td>A.H. 125</td>
<td>Eng. 102</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td><strong>3</strong></td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Engl. 101</td>
<td>Chem. 101</td>
<td>Military Science</td>
</tr>
<tr>
<td>1st. Mathematics</td>
<td><strong>5</strong></td>
<td>Elements of Dairy &amp; Food Industries</td>
</tr>
<tr>
<td>Math. 100</td>
<td>D.F.I. 114</td>
<td>Eng. 103</td>
</tr>
<tr>
<td>Military Science</td>
<td><strong>1</strong></td>
<td>Military Science</td>
</tr>
</tbody>
</table>

**Total** | **17** | **17** | **15**

Students with 1½ units of high school algebra may take Math. 101.

*One of the following courses may be substituted for A.H. 115: A.E. 225, Hort. 114 or 164; L.A. 112, 206 or 208; P.H. 101.
In addition to the courses listed, each student will be required to include in his freshman and sophomore years, A.H. 110; Ag. 101, 104; Libr. 106A and six quarters of physical education (see Physical Education for Men, page 212).

### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breads of Livestock</td>
<td>3</td>
<td>Breads of Livestock</td>
<td>3</td>
<td>Grain Crops</td>
<td>4</td>
</tr>
<tr>
<td>A.H. 211</td>
<td></td>
<td>A.H. 212</td>
<td></td>
<td>Agron. 214</td>
<td>4</td>
</tr>
<tr>
<td>Quantitative Analysis</td>
<td>4</td>
<td>Organic Chemistry</td>
<td>5</td>
<td>Agron. 234</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 103</td>
<td></td>
<td>Prin. of Economics</td>
<td></td>
<td>Meats</td>
<td></td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
<td>Ec. 242</td>
<td>3</td>
<td>A.H. 270</td>
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</tr>
<tr>
<td>Ec. 241</td>
<td></td>
<td>Aq. Phys.</td>
<td>3</td>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Anim. Dom. Animals</td>
<td>3</td>
<td>Prin. 204</td>
<td></td>
<td>Ec. 243</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
<td>Physiology of Domestic</td>
<td>2</td>
<td>Animal Biology</td>
<td>4</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td>Anims</td>
<td></td>
<td>Zool. 109</td>
<td>4</td>
</tr>
</tbody>
</table>
|                            | 16      | Military Science           | 2       | Military Science             | 1       | 16

### Junior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Fertility</td>
<td>4</td>
<td>Applied Animal Nutrition</td>
<td>3</td>
<td>Farm Mach. &amp; Power Mgt.</td>
<td>4</td>
</tr>
<tr>
<td>Agron. 354</td>
<td></td>
<td>A.H. 319</td>
<td></td>
<td>A.E. 334</td>
<td>4</td>
</tr>
<tr>
<td>Livestock Judging</td>
<td>2</td>
<td>General Bacteriology</td>
<td>5</td>
<td>Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>A.H. 305</td>
<td></td>
<td>Bact. 304E</td>
<td></td>
<td>Agron. 350</td>
<td>3</td>
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<tr>
<td>Fund. of Nutrition</td>
<td>3</td>
<td>General Genetics</td>
<td></td>
<td>Farm Mgt. and Organ.</td>
<td>4</td>
</tr>
<tr>
<td>A.H. 318</td>
<td></td>
<td>Gen. 360</td>
<td></td>
<td>Ec. 330</td>
<td>4</td>
</tr>
<tr>
<td>Speech-Making</td>
<td>3</td>
<td>Intro. to Soc.</td>
<td>3</td>
<td>Electives</td>
<td>6</td>
</tr>
<tr>
<td>Elective</td>
<td>5</td>
<td>Soc. 154</td>
<td>3</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
|                            | 17      | Electives                   | 3       |                            | 6       | 17

### Senior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Management</td>
<td>3</td>
<td>Milk Prod. &amp; Herd</td>
<td>3</td>
<td>Swing Prod. &amp; Mktg.</td>
<td>3</td>
</tr>
<tr>
<td>Agron. 454</td>
<td></td>
<td>Mgt., A.H. 434</td>
<td></td>
<td>A.H. 425</td>
<td>3</td>
</tr>
<tr>
<td>Mkt. Cl. &amp; Gr. of</td>
<td>2</td>
<td>Livestock Records</td>
<td>3</td>
<td>Beef Cattle Prod. &amp;</td>
<td>3</td>
</tr>
<tr>
<td>Livestock, A.H. 409</td>
<td></td>
<td>A.H. 460</td>
<td></td>
<td>Mktg. A.H. 427</td>
<td>3</td>
</tr>
<tr>
<td>Sheep Prod. &amp; Mktg.</td>
<td>2</td>
<td>History of Am. Agric.</td>
<td>3</td>
<td>Livestock Sanitation</td>
<td>3</td>
</tr>
<tr>
<td>A.H. 429</td>
<td></td>
<td>Hist. 324</td>
<td></td>
<td>V. Hyg. 427</td>
<td>3</td>
</tr>
<tr>
<td>American Govt.</td>
<td>3</td>
<td>Electives</td>
<td>7</td>
<td>Electives</td>
<td>7</td>
</tr>
<tr>
<td>Govt. 315</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Elective</td>
<td>5</td>
<td></td>
<td>3</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>
|                            | 15      |                            | 16      |                            | 16      | 16

The following courses are suggested as electives for students majoring in animal husbandry or dairy husbandry, who wish to prepare for these special fields:

- Livestock and Dairy Farming and Farm Management. A.H. 403, 431; P.H. 101; Ec. 403, 432, 435; Agron. 464; Eng. 404.
- Extension work. Agron. 464: T.Jl. 225; V.Ed. 466, 467; Soc. 386; Psych. 104; Sp. 312; Eng. 404.  
  (See statement on Training for Extension Service, page 58.)
- Meat Packing and Feed Manufacturing, Commercial Creamery, etc. Ec. 403; A.H. 403; Chem. 574; Back Sp. 311; Eng. 404.
- Graduate work. Students interested in graduate training in animal husbandry or dairy husbandry should consult with the head of the department and their adviser as early as possible, preferably in the first year. Appropriate electives and substitutions for certain required courses will be arranged to meet the needs of the individual student in preparation for graduate study. (See statement on training for graduate work, page 59.)

## Curriculum in Dairy Husbandry

Administered by the Department of Animal Husbandry.

Leading to the degree of Bachelor of Science.

Six months of practical work approved by the department is required before graduation.

### Freshman Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock Problems</td>
<td>3</td>
<td>Livestock Problems</td>
<td>3</td>
<td>Prin. of Crop Production</td>
<td>3</td>
</tr>
<tr>
<td>A.H. 112</td>
<td></td>
<td>A.H. 111</td>
<td></td>
<td>Agron. 114</td>
<td>3</td>
</tr>
<tr>
<td>General Botany</td>
<td>3</td>
<td>General Chemistry</td>
<td>4</td>
<td>Livestock Management</td>
<td>2</td>
</tr>
<tr>
<td>Bot. 101</td>
<td></td>
<td>Chem. 101</td>
<td></td>
<td>A.H. 125</td>
<td>2</td>
</tr>
<tr>
<td>Prin. of Comp.</td>
<td>3</td>
<td>Elements of Dairy &amp; Food Industries</td>
<td>4</td>
<td>General Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Engl. 101</td>
<td></td>
<td>D.F.I. 114</td>
<td></td>
<td>Chem. 102</td>
<td>4</td>
</tr>
<tr>
<td>*Ag. Mathematics</td>
<td>3</td>
<td>Prin. of Comp.</td>
<td>3</td>
<td>Prin. of Comp.</td>
<td>3</td>
</tr>
<tr>
<td>Math 103</td>
<td></td>
<td>Engl. 102</td>
<td></td>
<td>Eng. 103</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
<td>Military Science</td>
<td>1</td>
<td>Animal Biol.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td>15</td>
<td>Zool. 109</td>
<td>4</td>
</tr>
</tbody>
</table>

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: A.H. 110, Ag. 101, 104, Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212).

*Students with 1½ units of high school algebra may take Math. 101.*
In addition to the courses listed each student will be required to include in his freshman and sophomore years: D.F.I. 110, Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212).

### Curriculum in Dairy Industry

Leading to the degree of Bachelor of Science.

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Test &amp; Inspect. of Milk and Its Products</td>
<td>4</td>
</tr>
<tr>
<td>Elements of Dairying</td>
<td>4</td>
</tr>
<tr>
<td>Prize of Composition</td>
<td>3</td>
</tr>
<tr>
<td>Drawing for Teachers of Agriculture</td>
<td>2</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Qualitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>5</td>
</tr>
<tr>
<td>Jail. Prod.</td>
<td>3</td>
</tr>
<tr>
<td>Propaganda Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Publicity Methods</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

#### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Farm Problems</td>
<td>3</td>
</tr>
<tr>
<td>Livestock Records</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

#### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Govt</td>
<td>3</td>
</tr>
<tr>
<td>Hist. of American Agric.</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

## DAIRY INDUSTRY

### Leading to the degree of Bachelor of Science.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain Crops</td>
<td>4</td>
</tr>
<tr>
<td>Breeds of Livestock</td>
<td>3</td>
</tr>
<tr>
<td>Qualitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Anat. Domestic An.</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeds of Livestock</td>
<td>3</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Physiol. of Dom. Animals</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

### Summer Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage Crops</td>
<td>3</td>
</tr>
<tr>
<td>Meats</td>
<td>3</td>
</tr>
<tr>
<td>Dairy Cattle Judging</td>
<td>2</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>4</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Fertility</td>
<td>3</td>
</tr>
<tr>
<td>Applied Animal Nutr.</td>
<td>4</td>
</tr>
<tr>
<td>Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>Animal Reproduction</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

### Summer Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Govt.</td>
<td>3</td>
</tr>
<tr>
<td>Hist. of American Agric.</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Test &amp; Inspect. of Milk and Its Products</td>
<td>4</td>
</tr>
<tr>
<td>Elements of Dairying</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>Drawing for Teachers of Agriculture</td>
<td>2</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Qualitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>5</td>
</tr>
<tr>
<td>Jail. Prod.</td>
<td>3</td>
</tr>
<tr>
<td>Propaganda Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Publicity Methods</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>
Fall Quarter

General Bacteriology 5
Dairy Chemistry 5
Chemistry 1 Ad. 372 4
Speech Making 3

Winter Quarter

Dairy Chemistry 5
Chemistry 348 1
Manufacture of Butter 5
D.F.I. 304 1
Judging Dairy Products 1
D.F.I. 308 1
Dairy Bacteriology 1
D.F.I. 350
Electives 1

Credits 17

Senior Year

Condensed Milk Prod. 5
D.F.I. 494 5
Seminar 2
D.F.I. 405 2
Dairy Plant Equipment 4
D.F.I. 406 4
Bact. of Butter & Cheese 2
D.F.I. 558 2

Electives 5

Credits 18

*D.F.I. 458 or 559 is required. An elective may be substituted for one of these courses.

Option in Dairy Industry and Economics

Students who wish to major in this field will be required to take a minimum of 12 credits selected from the following courses in Economics: 304, 402, and will add Chem. 231; I.Ad. 368, 384, 385, 386; Math. 112, 113; Engl. 404; Sp. 312; I.E. 351. The following courses may be omitted: D.F.I. 347, 348; Chem. 103, 211, 334, 335; Math. 102A; Agron. 234, and I.Ad. 372.

Option in Dairy Industry and Chemistry

Students who wish to major in this field preparing themselves for research work in dairy industry will be required to include the following courses: M.L. 201A, 202A, or M.L. 231A, 232A, 233A; Chem. 321, 322, 323, 334, 335, 336; Math. 103, 211, 212, 213; Phys. 213; D.F.I. 559. The following courses may be omitted: A.E. 157; Agron. 234, Ec. 241, 242, 243; I.Ed. 372. Inasmuch as the sequences of chemistry courses plus the hours required will not permit the completion of this joint major in four years, it is desirable to complete a year's work (45 quarter credits) at some approved college before entering, or to take an extra year at this institution. If the former, 9 quarter credits each in English and modern language and 12 quarter credits in general chemistry should be included.

Curriculum in Food Industries

Freshman Year

General Chemistry 4
Chem. 101 1
Elements of Dairy and Food Industries D.F.I. 114 4
Prin. of Composition Engl. 101 3
College Algebra Math. 101 5
Military Science 1

Credits 17

Sophomore Year

Quantitative Chemistry Chem. 211 5
Organic Chemistry Chem. 334 4
Speech Making Sp. 311 3
General Zoology Zool. 101 4
Military Science 1

Credits 17

Spring Quarter

Dairy Chemistry 5
Chem. 348 1
Manufacture of Butter 5
D.F.I. 304 1
Judging Dairy Products 1
D.F.I. 308 1
Dairy Bacteriology 1
D.F.I. 350
Electives 1

Credits 17

Juniors Year

Dairy Chemistry 5
Chem. 348 1
Manufacture of Butter 5
D.F.I. 304 1
Judging Dairy Products 1
D.F.I. 308 1
Dairy Bacteriology 1
D.F.I. 350
Electives 1

Credits 17

Spring Quarter

Market Milk 5
D.F.I. 305 1
Mtg. of Ice Cream and Ice Cream 5
D.F.I. 306 1
Tech. Advertising 1
T.J.I. 325 1
Electives 3

Credits 16

Senior Year

Dairy Plant Equipment 4
D.F.I. 492 4
Mgt. of Dairy Plants 5
D.F.I. 494 5
Electives 8
Milk Inspection D.F.I. 458 4
D.F.I. 559 5
Business Law 1
Sp. or I. Ad. 365C 3
Electives 2

Credits 16

In addition to the courses listed, each student will be required to include in his freshman and sophomore years, D.F.I. 110; Ag. 101, 104; Libr. 106A and six consecutive quarters of physical education. (See Physical Education for Men. page 212.)
Curriculum in Farm Operation

Administered by the Division of Agriculture.

A. Winter Quarter Program.

A winter quarter collegiate program is available to the student who plans to spend only one quarter in college. All of the courses required in this program will apply toward a Bachelor of Science degree in the event that the student decides to remain in or return to college. The student who decides to continue in college will follow the regular Farm Operation curriculum, described below, or transfer to another curriculum.

Winter Quarter Program

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag. 110. Technical Lecture</td>
<td>R</td>
</tr>
<tr>
<td>Agron. 154B. Soils</td>
<td>3</td>
</tr>
<tr>
<td>Agron. 114. Principles of Crop Production</td>
<td>3</td>
</tr>
<tr>
<td>A.H. 114. Livestock Problems</td>
<td>3</td>
</tr>
<tr>
<td>A.H. 216. Livestock Feedings and Management</td>
<td>3</td>
</tr>
<tr>
<td>Ec. 130. Elements of Farm Management</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
</tr>
</tbody>
</table>

B. The Two-Year Program.

Leading to a certificate showing completion of the program.

This program is designed for students of agriculture who have decided to engage in general farming and who find it impracticable to remain in college longer than one or two years. The course of study in this program is outlined below. However, considerable deviation from the outlined program will be permitted in order to serve better the vocational and cultural needs and interests of individual students. Such adjustments will be worked out by the student and his adviser.
In addition to the courses listed, each student will be required to include in his freshman and sophomore years: Ag. 101, 104, 110; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212).


### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Quarter Credits</th>
<th>Winter Quarter Credits</th>
<th>Spring Quarter Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils &amp; Water Conserv.</td>
<td>Grain Crops Agron. 214</td>
<td>Farm Machinery A.E. 334</td>
</tr>
<tr>
<td>Rural Inst. &amp; Organiza.</td>
<td>Livestock Feed &amp; Mgt. A.H. 216</td>
<td>Forage Crops Agron. 234</td>
</tr>
<tr>
<td>Electives</td>
<td>Ag. Physics Phys. 204</td>
<td>Electives</td>
</tr>
<tr>
<td>Military Science</td>
<td>Speech-Making Sp. 311</td>
<td>Military Science</td>
</tr>
</tbody>
</table>

| 17 | 17 | 17 |

*Students who plan to take the four-year course should omit A.H. 216 and take A.H. 318 after completing the chemistry prerequisites, and should take Gen. 300 instead of Gen. 200.

C. The Four-Year Curriculum in Farm Operation.

Leading to the degree of Bachelor of Science.

### Freshman and Sophomore Years

The first two years of the four-year curriculum are identical to the two-year program in Farm Operation. Students who have elected a modified two-year program and who later wish to transfer to the four-year curriculum may do so with the approval of the Dean of Agriculture.

### Junior and Senior Years

The junior and senior years will cover a minimum of 102 credits and will be planned to aid the student in achieving his goals in the field of agriculture. During the last quarter of the sophomore year, a program covering the work of the junior and senior years will be outlined by each student in conference with his adviser. These individual programs will be subject to the approval of the Dean of Agriculture.

In order that the graduates of this curriculum may have a well-rounded general, scientific and technical education the course of study for the last two years must include the following: a minimum of 28 credits in the fields of biological and physical sciences (including at least one course in organic chemistry), 24 credits in social sciences and 24 credits in technical agriculture. The remaining 26 are elective. A minimum of 200 credits is required for graduation.

### Curriculum in Forestry

Leading to the degree of Bachelor of Science upon satisfactory completion of four years of work in either the Forest Management or Wood Utilization option; and degree of Bachelor of Science with major in conservation, forest utilization and marketing, range management, wildlife management or farm forestry on completion of a fifth year of work.
Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Botany</td>
<td>3</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>General Forestry</td>
<td>3</td>
</tr>
<tr>
<td>College Algebra</td>
<td>5</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Botany</td>
<td>3</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>General Forestry</td>
<td>3</td>
</tr>
<tr>
<td>Engineering Problems</td>
<td>1</td>
</tr>
<tr>
<td>Animal Biology</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
</tbody>
</table>

Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systematic Botany</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>Elementary Forest Measurements</td>
<td>1</td>
</tr>
<tr>
<td>Animal Biology</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

Freshman Year

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: For. 110, Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212).

Summer Camp (Required)

The summer camp is conducted for ten weeks during the summer between the freshman and sophomore years and is prerequisite to admission to the junior year. The following courses are offered at the freshman summer camp: Silviculture, For. 214, Cr. 3; Wood Utilization, For. 234, Cr. 3; Forest Mensuration, For. 244, Cr. 4; Forest Operations, For. 250, Cr. 3; Forest Mapping, For. 243, Cr. 2.

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dendrology</td>
<td>3</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Ec.</td>
<td>3</td>
</tr>
<tr>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>Forest Insects</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his freshman and sophomore years: For. 110, Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212).

Pre-Graduate Training

Students interested in graduate training in Forest Management or Wood Utilization should consult with their adviser and the head of the department as early as possible preferably at the beginning of the sophomore year. A sequence of courses will be outlined and where desirable certain substitutions will be arranged with the approval of the adviser and the head of the department.

Forest Management Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveying and Map Making</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 310</td>
<td></td>
</tr>
<tr>
<td>Logging &amp; Milling</td>
<td>4</td>
</tr>
<tr>
<td>For. 224</td>
<td></td>
</tr>
<tr>
<td>Forest Range Mgt. For. 491</td>
<td>3</td>
</tr>
<tr>
<td>Gen. Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Gen. 300</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 311, 312, 313.

Advanced Summer Camp (Optional)

Six-week camp optional for students completing the junior year. A full camp schedule is made up of a total of 9 credits chosen from the following: Forest Utilization, For. 489, Cr. 3 to 9; Forest Management, For. 495, Cr. 3 to 9; Forest Range Management, For. 494, Cr. 3 to 9. The foregoing credits may be used as electives.
### Regional Silviculture
<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>For. 303</td>
<td>Writing of Scientific Papers</td>
<td>Forest Pathology</td>
</tr>
<tr>
<td>For. 445</td>
<td>Engl. 414</td>
<td>Bot. 416</td>
</tr>
<tr>
<td>For. 486</td>
<td>T.I.J. 225</td>
<td>Forest Policy &amp; Adm.</td>
</tr>
<tr>
<td>For. 490</td>
<td>Forest Management</td>
<td>For. 402</td>
</tr>
<tr>
<td>For. 492</td>
<td>Govt. 315</td>
<td>Electives</td>
</tr>
<tr>
<td>Electives</td>
<td>American Government</td>
<td>For. 498</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 411, 412, 413.

### Specialized Training
Students in the Forest Management option who wish to develop their work toward specialized fields are advised to select elective credit from the courses listed in the groups following:

#### Forest Management
- Agron. 464; Bot. 204, 424, 577; Ec. 243, 304, 304, 510; Engl. 205, 305, 404; For. 321, 443, 502, 507; I.A.D. 365C, 364; Psych. 104, 474; Sp. 312, 334; Stat. 201.

#### Forest Range Management

#### Wildlife Management
- Zool. 501, 541, 542, 544, 545, 561, 562, 563.

### Wood Utilization Option

#### Junior Year
- Elem. Surveying and Map Making: C.E. 310, 5
- Logging & Milling: For. 224, 4
- Speech-Making: Sp. 211, 3
- Electives: 5

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing of Scientific Papers</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 414</td>
<td></td>
</tr>
<tr>
<td>T.I.J. 225</td>
<td>3</td>
</tr>
<tr>
<td>Forest Management</td>
<td>3</td>
</tr>
<tr>
<td>Govt. 315</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 311, 312, 313.

#### Advanced Summer Camp (Optional)
Six-week camp optional for students completing the junior year. A full camp schedule is made up of a total of 9 credits chosen from the following: Forest Utilization, For. 489, Cr. 3 to 9; Forest Management, For. 495, Cr. 3 to 9; Forest Range Management, For. 494, Cr. 3 to 9. The foregoing credits may be used as electives.

#### Senior Year
- Seasoning of Wood: For. 425, 3
- Forest Products: For. 406, 3
- Forest Finance: For. 490, 3
- Electives: 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Deterioration Bot. 417</td>
<td>4</td>
</tr>
<tr>
<td>Lumber Markets For. 438</td>
<td>3</td>
</tr>
<tr>
<td>Forest Management For. 497</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 411, 412, 413.

*Students in the Wood Utilization option who wish to be eligible for federal appointment as a Junior Forester should take Forestry 491 or a course in Wildlife Management.

### Specialized Training
Students in the Wood Utilization option must choose at least six hours of elective credits in one of the following groups:

#### Chemical or Mechanical Utilization
- Bot. 204; Chem. 103, 321, 322, 323, 334, 335, 483, 484; Math. 103, 211, 212, 213; Phys. 213; Stat. 201, 401, 402; T.&A.M. 274, 324.

#### Retail Lumber

#### Timber Industries
Fifth Year Majors

Students expecting to complete any one of the fifth year groups should consult with their advisers during or before the junior year at which time the subjects to be taken will be outlined for the individual student for the senior and fifth years. This will make possible a proper sequence of subjects and provide for the courses of instruction required for the particular major group of his selection. Major sequences are those leading to the degree of Bachelor of Science with majors in one of the following: forestry and conservation, forest utilization, forestry and range management, forestry and wildlife management, or farm forestry.

Curriculum in Horticulture

Winter Quarter Program

For the student who plans to spend only one quarter in college. For students who decide to continue in college all of the courses required in this program will apply in the 4-year horticulture curriculum.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agron. 154B Soils</td>
<td>3</td>
</tr>
<tr>
<td>Hort. 105 Greenhouse and Nursery Mgmt</td>
<td>2</td>
</tr>
<tr>
<td>Hort. 110 Introduction to Horticulture</td>
<td>R</td>
</tr>
<tr>
<td>Hort. 114 General Horticulture</td>
<td>3</td>
</tr>
<tr>
<td>Hort. 146B Home Floriculture and Flower Arrangement</td>
<td>2</td>
</tr>
<tr>
<td>Hort. 154 Greenhouse Methods</td>
<td>3</td>
</tr>
<tr>
<td>Hort. 214 Plant Propagation</td>
<td>3</td>
</tr>
</tbody>
</table>

Four-Year Curriculum leading to the degree of Bachelor of Science.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>General Botany 3 credits</td>
</tr>
<tr>
<td></td>
<td>Prin. of Crop Production 3 credits</td>
</tr>
<tr>
<td></td>
<td>General Botany 3 credits</td>
</tr>
<tr>
<td></td>
<td>Prin. of Composition 3 credits</td>
</tr>
<tr>
<td></td>
<td>General Horticulture 3 credits</td>
</tr>
<tr>
<td></td>
<td>*Ag. Mathematics 3 credits</td>
</tr>
<tr>
<td></td>
<td>Math. 100 5 credits</td>
</tr>
<tr>
<td></td>
<td>College Algebra 1</td>
</tr>
<tr>
<td></td>
<td>Military Science 1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soils 4 credits</td>
</tr>
<tr>
<td></td>
<td>Agron. 154 4 credits</td>
</tr>
<tr>
<td></td>
<td>General Chemistry 4 credits</td>
</tr>
<tr>
<td></td>
<td>Prin. of Composition 4 credits</td>
</tr>
<tr>
<td></td>
<td>Vegetable Crops 3 credits</td>
</tr>
<tr>
<td></td>
<td>Hort. 164 3 credits</td>
</tr>
<tr>
<td></td>
<td>Gen. Psychology 3 credits</td>
</tr>
<tr>
<td></td>
<td>Hort. 154 3 credits</td>
</tr>
<tr>
<td></td>
<td>Military Science 1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Students with 1½ units of high school algebra may take Math. 101.

Sophomore Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Ag. Meteorology 3 credits</td>
</tr>
<tr>
<td></td>
<td>Qualitative Analysis 4 credits</td>
</tr>
<tr>
<td></td>
<td>Principles of Economics 3 credits</td>
</tr>
<tr>
<td></td>
<td>Ag. Physics 3 credits</td>
</tr>
<tr>
<td></td>
<td>Elem. Entomology 4 credits</td>
</tr>
<tr>
<td></td>
<td>Military Science 1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elem. Plant Physiology 4 credits</td>
</tr>
<tr>
<td></td>
<td>Organic Chemistry 5 credits</td>
</tr>
<tr>
<td></td>
<td>Prin. of Economics 3 credits</td>
</tr>
<tr>
<td></td>
<td>Plant Propagation 3 credits</td>
</tr>
<tr>
<td></td>
<td>Hort. 214 3 credits</td>
</tr>
<tr>
<td></td>
<td>Military Science 1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soils 3 credits</td>
</tr>
<tr>
<td></td>
<td>Agron. 354 4 credits</td>
</tr>
<tr>
<td></td>
<td>Gen. Genetics 3</td>
</tr>
<tr>
<td></td>
<td>Hist. of Amer. Agr. 3 credits</td>
</tr>
<tr>
<td></td>
<td>Commercial Orcharding 3 credits</td>
</tr>
<tr>
<td></td>
<td>Commercial Floriculture 3 credits</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Memory Methods 3</td>
</tr>
<tr>
<td></td>
<td>Plant Materials 3</td>
</tr>
<tr>
<td></td>
<td>Insects Affecting Hort. 3 credits</td>
</tr>
<tr>
<td></td>
<td>Electives 3 credits</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At the beginning of the junior year, the student may choose an option in fruit crops, floriculture, nursery management, vegetable crops or turf management.
<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Senior Year</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
</tr>
<tr>
<td>Seminar</td>
<td>Prin. of Plant Pathology</td>
<td>American Government</td>
</tr>
<tr>
<td>Hort. 401</td>
<td>Bot. 407</td>
<td>Govt. 315</td>
</tr>
<tr>
<td>Systematic Fruit Crops</td>
<td>Hort. 402</td>
<td>Seminar</td>
</tr>
<tr>
<td>Hort. 434</td>
<td>Marketing Horticultural Crops</td>
<td>Hort. 403</td>
</tr>
<tr>
<td>Systematic Veg. Crops</td>
<td>Hort. 414</td>
<td>Electives</td>
</tr>
<tr>
<td>Hort. 465</td>
<td>Systematic Floriculture</td>
<td>Hort. 444</td>
</tr>
<tr>
<td>Electives in English</td>
<td>Hort. 444</td>
<td>Electives</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 16

**Specialized Training**

The curriculum in horticulture provides opportunities for specialized training in one or two of several phases of horticulture. Within the junior and senior years the following courses are required or suggested as electives:

**Floriculture**
- Required: Hort. 344, 447.
- Suggested electives: Arch. 214, Psych. 284, 285.

**Fruit Crops**
- Required: Hort. 422, 424.

**Nursery Management**
- Required: Hort. 313.

**Vegetable Crops**
- Required: Hort. 564.

**Turf Management**
- Required: A.E. 306; Agron. 234, 434, 453, 466; Hort. 313, 314.

The following courses are recommended for students interested in preparing for graduate study:
- Chem. 211, 212, 334, 335; M.L. 231, 232, 233; Math. 101, 102A, 103, 211, 212; Phys. 211, 212.

The above courses may be substituted for the following courses in the regular curriculum: Agron. 114; Psych. 104; L.A. 231, 232; Phys. 394; Hort. 344, 424, 414, or may be taken as electives.

**Curriculum in Industrial Education**

Administered by the Department of Vocational Education.

Leading to the degree of Bachelor of Science.

Provides preparation for teachers of industrial arts, or trades and industry, or both.

**Freshman Year**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Working Drawing &amp; Appl'd Graphics</th>
<th>Graphical Theory &amp; Application</th>
<th>E.Dr. 131</th>
<th>E.Dr. 132</th>
<th>E.Dr. 133</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.Dr. 131</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Prin. of Composition Engl. 101</td>
<td>Prin. of Composition Engl. 102</td>
<td>Prin. of Composition Engl. 103</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Woodworking I.Ed. 105</td>
<td>Woodwork I.Ed. 206</td>
<td>Woodwork I.Ed. 207</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Woodworking I.Ed. 106</td>
<td>Industrial Arts Design I.Ed. 250</td>
<td>Industrial Arts Design I.Ed. 251</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>College Algebra Math. 101</td>
<td>Plane Trigonometry Math. 102A</td>
<td>Plane Trigonometry Math. 102A</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Military Science</td>
<td>Military Science</td>
<td>Military Science</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total Credits:** 18

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: V.Ed. 110; Ag. 101; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212.)

*Electives may be chosen from a minor field or additional courses in industrial education.
### Sophomore Year

#### Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freehand Drawing</td>
<td>2</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Bench Metalwork</td>
<td>3</td>
</tr>
<tr>
<td>Ag. Physics</td>
<td>3 or 4</td>
</tr>
<tr>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Ornamental Metalwork</td>
<td>3</td>
</tr>
<tr>
<td>Practical Electricity I</td>
<td>3</td>
</tr>
<tr>
<td>Machine Shop</td>
<td>2</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Principles of Education</td>
<td>2</td>
</tr>
<tr>
<td>Sheet Metal Work</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>3</td>
</tr>
</tbody>
</table>

^1 Electives may be chosen from a minor field or additional courses in industrial education.

### Junior and Senior Years

1. In the final quarter of the sophomore year, the student will select the area of industrial education in which he wishes to specialize or will decide to continue with a general program of industrial education. He will also select one or two minor fields which, together with his major field and supporting work, will form the basis for the program of the junior and senior years. This program will cover a minimum of one hundred and one credits. The complete program will be worked out by the student in conference with his adviser, subject to the approval of the head of the department and the dean of the division. Duplicate copies are to be filed in the dean's office.

2. A minimum of forty credits in industrial education shall be required for graduation. In addition, supporting subjects shall be included which are necessary for the proper development of the major field and which give a general cultural background. Areas of industrial education in which the student may specialize are: Mechanical drawing, woodworking, metalworking, electricity and crafts.

3. The minor fields of work are usually chosen from the areas of agriculture or science but they may be selected from any area offered at Iowa State College. The minor fields must include the minimum recommended credits in order to meet the requirements in Iowa for the Professional Certificate. (See page 239.) Credit well beyond this minimum will ordinarily be encouraged for graduation.

4. The subjects making up the program of the junior and senior years must ordinarily be 300 and 400 courses.

5. The following subjects must be included as indicated, unless completed previously:
   (a) Ec. 305. Economics of Industrial Relations. Cr. 3.
   (b) Engl. 205. Propaganda Analysis, Reasoning and Writing, Cr. 3 or Engl. 404. Business Correspondence. Cr. 2.
   (c) Sp. 311. Speech-Making. Cr. 3.
   (d) Hist. 211, 212, and 213. European and American Civilization. Cr. 3 each or Hist. 334 and 335. Economic History of the United States. Cr. 3 each.
   (e) Soc. 134. Introduction to Sociology. Cr. 3.
   (f) A.E. 359, Machine Construction (Welding) Cr. 2.
   (g) I.Ed. 252, Practical Electricity II, Cr. 3.
   (h) I.Ed. 350, School Shop Safety Education, Cr. 2.

6. A list of the courses required of students qualifying to teach industrial arts or trade and industrial education is on file with the student's adviser and in the Department of Vocational Education. Professional courses in education in psychology and professional work must be taken to qualify for a teacher's certificate. The following courses are required for the Professional Certificate: V.Ed. 204, 305, 426; Psych. 104, 234 and 334; Govt. 315; Sp. 311. Courses in special methods and supervised student teaching are also required.

7. A student will be required to complete at least 12 weeks of practical work in the trades or industry before he graduates with a Bachelor of Science degree in Industrial Education.
Pre-Graduate Training

Students interested in graduate training in industrial education should consult with the adviser and the head of the department, preferably as early as the beginning of the sophomore year. A modified curriculum will be outlined, subject to the approval of the classifying officer, to meet the individual needs of the student in preparation for graduate study.

Curriculum in Landscape Architecture

Leading to the degree of Bachelor of Science.

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Freshman Year</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Botany</td>
<td>3</td>
<td>General Chemistry</td>
<td>4</td>
<td>Arch. Drawing</td>
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<tr>
<td>Bot. 101</td>
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<td>Chem. 101</td>
<td></td>
<td>Arch. 103</td>
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<tr>
<td>Prin. of Composition</td>
<td>3</td>
<td>Bot. 102</td>
<td>3</td>
<td>Soils</td>
<td>4</td>
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<tr>
<td>Engr. 101</td>
<td></td>
<td>or</td>
<td></td>
<td>Agron. 154</td>
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<td>L.A. Drawing</td>
<td>3</td>
<td>General Horticulture</td>
<td>3</td>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>L.A. 111</td>
<td></td>
<td>Hort. 114</td>
<td></td>
<td>Eng. 103</td>
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<tr>
<td>College Algebra</td>
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<td>Prin. of Composition</td>
<td>3</td>
<td>Garden Flowers</td>
<td>3</td>
</tr>
<tr>
<td>Math. 101</td>
<td></td>
<td>Engr. 102</td>
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<td>Hort. 244</td>
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<tr>
<td>Military Science</td>
<td>1</td>
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<td>3</td>
<td>L.A. 113</td>
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<tr>
<td></td>
<td></td>
<td>Plane Trigonometry</td>
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<td>Military Science</td>
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<td>1</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>17</td>
<td></td>
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</tr>
</tbody>
</table>

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: L.A. 110, Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212.)

Sophomore Year

<table>
<thead>
<tr>
<th>Arch. Design &amp; Sketching</th>
<th>5</th>
<th>Arch. Design &amp; Color</th>
<th>5</th>
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<tbody>
<tr>
<td>Arch. 201</td>
<td></td>
<td>Arch. 202</td>
<td></td>
</tr>
<tr>
<td>Elementary Surveying</td>
<td>3</td>
<td>Top. &amp; Cad. Surveying</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 211</td>
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<td>C.E. 212</td>
<td></td>
</tr>
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<td>L.A. History</td>
<td>3</td>
<td>L.A. History</td>
<td>3</td>
</tr>
<tr>
<td>L.A. 201</td>
<td></td>
<td>L.A. 202</td>
<td></td>
</tr>
<tr>
<td>Elements &amp; Theory of</td>
<td>3</td>
<td>Elements &amp; Theory</td>
<td>3</td>
</tr>
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<td>Landscape Design L.A. 211</td>
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<td>of Landscape Design</td>
<td></td>
</tr>
<tr>
<td>Introd. to Sociology Soc. 134</td>
<td>3</td>
<td>Introd. to L.A. Design</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
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<td>L.A. 231</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Military Science</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>American Govt.</td>
<td>3</td>
<td>History of Arch.</td>
<td>3</td>
</tr>
<tr>
<td>Govt. 315</td>
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<td>Arch. 352</td>
<td></td>
</tr>
<tr>
<td>Details of Construction L.A. 301</td>
<td>9</td>
<td>Details of Construction</td>
<td>3</td>
</tr>
<tr>
<td>L.A. 301</td>
<td></td>
<td>L.A. 302</td>
<td></td>
</tr>
<tr>
<td>Landscape Design</td>
<td>3</td>
<td>Landscape Design</td>
<td>3</td>
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<tr>
<td>L.A. 311</td>
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<td>L.A. 312</td>
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<td>Plant Materials</td>
<td>3</td>
<td>Planting Design</td>
<td>3</td>
</tr>
<tr>
<td>L.A. 334</td>
<td></td>
<td>L.A. 334</td>
<td></td>
</tr>
<tr>
<td>City or Town Planning L.A. 401</td>
<td>3</td>
<td>Planning &amp; Zoning Adm.</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
<td>L.A. 402</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Electives</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

Junior Year

| Roads & Pavement C.E. 354 | 3 | Prin. of Economics C.E. 404 | 3 |
| Landscape Design L.A. 411 | 4 | Physical Geology Geol. 202 | 3 |
| Publicity Method T.H. 225 | 3 | Landscape Service L.A. 305 | 3 |
|                          | 6 | Travel & Practice L.A. 342 |     |
| Electives                | 18|                    | 16|

Senior Year

| Engr. in City Planning C.E. 404 | 3 |              |     |
| Prin. of Economics Ec. 241 | 3 | Physical Geology Geol. 202 | 3 |
| Landscape Design L.A. 412 | 4 | Landscape Service L.A. 305 | 3 |
| Speech-Making Sp. 311 | 3 | Travel & Practice L.A. 342 |     |
| Electives                | 3 |                    | 3 |

In addition to the courses listed, each student will be required to include in his junior and senior years: L.A. 110, Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212.)
Students specializing in selected options will be required to make the following substitutions:

**Urban Planning**
- C.E. 352 for Arch. 352
- Arch. 336 for Arch. 333
- Stat. 201—5 credits for L. A. 335
- Soc. 410 Sr. F. for elective
- L.A. 514 Sr. W. for elective
- L.A. 515 for L.A. 305

**Domestic**
- Zool. 377 for Soc. 134 Soph. F.
- Psych. 254 for Arch. 352
- I.Ad. 371 for L.A. 402
- A.A. 384 for Arch. 333
- Hort. 316 for L.A. 403
- L.A. 404 for C.E. 354
- L.A. 452 for C.E. 404
- L.A. 436 Sr. F. for elective

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**Curriculum in Poultry Husbandry**

Leading to the degree of Bachelor of Science.

Six months of practical work, approved by the department, in the branch of the industry of particular interest to the student is required before graduation (Ag. 104).

### Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Poultry Husbandry</td>
<td>3</td>
</tr>
<tr>
<td>Prin. of Crop Production</td>
<td>3</td>
</tr>
<tr>
<td>Agron. 114</td>
<td></td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 101</td>
<td></td>
</tr>
<tr>
<td>*Ag. Mathematics</td>
<td>5</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry Farm Mgt.</td>
<td>3</td>
</tr>
<tr>
<td>Soils</td>
<td>4</td>
</tr>
<tr>
<td>Agron. 154</td>
<td></td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Engl. 102</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

### Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Carpentry</td>
<td>2</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Gen. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>General Horticulture</td>
<td>3</td>
</tr>
<tr>
<td>Anat. Domestic Animals V. Anat.217</td>
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</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>Prin. of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Gen. Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Speech-Making</td>
<td>3</td>
</tr>
<tr>
<td>Physiol. of Domes. Animals</td>
<td>3</td>
</tr>
<tr>
<td>V. Phys. 264</td>
<td>3</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey Production</td>
<td>3</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Prin. of Composition</td>
<td>4</td>
</tr>
<tr>
<td>Animal Biology</td>
<td>4</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
</tr>
</tbody>
</table>

In addition to the courses listed, each student will be required to include in his freshman and sophomore years: P.H. 110; Ag. 101, 104; Libr. 106A and six quarters of physical education. (See Physical Education for Men, page 212.)

*Students with 1½ units of high school algebra may take Math. 101.*

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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>Poultry Show Org. &amp; Adm.</td>
<td>3</td>
</tr>
<tr>
<td>Physiol. of Domes. Fowls V. Phys. 366</td>
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</tr>
<tr>
<td>*Electives</td>
<td>9</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Correspondence</td>
<td>2</td>
</tr>
<tr>
<td>American Government</td>
<td>3</td>
</tr>
<tr>
<td>Poultry Seminar</td>
<td>4</td>
</tr>
<tr>
<td>Poultry Sanitation</td>
<td>3</td>
</tr>
<tr>
<td>Business Correspondence</td>
<td>2</td>
</tr>
<tr>
<td>Poultry Breeding</td>
<td>3</td>
</tr>
<tr>
<td>Poultry Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Poultry Sanitation</td>
<td>3</td>
</tr>
<tr>
<td>*Electives</td>
<td>9</td>
</tr>
</tbody>
</table>

*See page 58 Specialized Training.*
Specialized Training

The curriculum in Poultry Husbandry provides training in four fields of specialization. The required courses and the approved elective courses for each field are listed below.

Commercial Poultry Farm and Hatchery Operations

Required: Ag. 104.

Produce Plant Operations

Required: Ag. 104.
Electives: Math. 101, 102, 103, 211, 212, 213; Phys. 211, 212, 213; Chem. 334, 335; A.H. 374; D.F.I. 114, 258.

Feed and Equipment Manufacturing, Advertising and Sales

Required: Ag. 104.
Electives: A.H. 111, 112; T.J.I. 325, 335; Ec. 438; I.Ad. 385, 480.

Pre-Graduate Training

Required: Ag. 104.
Electives: Math. 101, 102, 103; Chem. 334, 335; V.Ed. 204, 561; Phys. 211, 212, 213; M.L. 201, 202, 203, 231, 232, 233.

Program in Dairy Plant Operation

Administered by the Department of Dairy and Food Industries. Leading to a certificate.
This program includes the manufacture of the various milk products and the handling of market milk. The object is to fit students for positions as butter, cheese, and ice cream makers, milk plant operators, or managers of dairy plants.
For description of courses in Dairy and Food Industries, see page 152.

<table>
<thead>
<tr>
<th>First Quarter—Fall</th>
<th>Second Quarter—Winter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Machinery</td>
<td>Dairy Cattle Feeding and Management</td>
<td>3</td>
</tr>
<tr>
<td>D.F.I. 289</td>
<td>A.H. 135</td>
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</tr>
<tr>
<td>Dairy Technology</td>
<td>Dairy Technology</td>
<td>4</td>
</tr>
<tr>
<td>D.F.I. 152</td>
<td>D.F.I. 153</td>
<td></td>
</tr>
<tr>
<td>Testing Milk &amp; Milk Products</td>
<td>Ice Cream and Ices</td>
<td>4</td>
</tr>
<tr>
<td>D.F.I. 156</td>
<td>D.F.I. 158</td>
<td></td>
</tr>
<tr>
<td>Dairy Bacteriology</td>
<td>Elements of Dairy Economics</td>
<td>5</td>
</tr>
<tr>
<td>D.F.I. 265</td>
<td>Ec. 265</td>
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</tr>
<tr>
<td>Academic Earning Skills</td>
<td>Prin. of Composition</td>
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<tr>
<td>Psych. 10</td>
<td>Engl. 101</td>
<td>3</td>
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<tr>
<td></td>
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</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Ag. 104 and two quarters of physical education. (See Physical Education for Men, page 212.)

<table>
<thead>
<tr>
<th>Third Quarter—Fall</th>
<th>Fourth Quarter—Winter</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Market Milk</td>
<td>Butter Manufacture</td>
<td>5</td>
</tr>
<tr>
<td>D.F.I. 256</td>
<td>D.F.I. 157</td>
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</tr>
<tr>
<td>Condensed and Powdered Milk</td>
<td>Cheese Manufacture</td>
<td>4</td>
</tr>
<tr>
<td>D.F.I. 258</td>
<td>D.F.I. 159</td>
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</tr>
<tr>
<td>Special Problems</td>
<td>Dairy Plant Management</td>
<td>2</td>
</tr>
<tr>
<td>D.F.I. 264</td>
<td>D.F.I. 260</td>
<td></td>
</tr>
<tr>
<td>Accounting I</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>I. Ad. 384C</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Prin. of Composition</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Engl. 102</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

For undergraduate curriculum in dairy industry with options in dairy industry and chemistry, and in dairy industry and economics, see page 48.

Training in Agriculture with Special Objectives

Training for Extension Service
Students interested in preparing for work in the Extension Service may be referred to an Extension adviser who is a member of the Agricultural Extension Service Central Staff. In cooperation between the Extension adviser and the student's departmental adviser, the courses listed on page 59 may be recommended for substitution in place of required courses or used as electives in the student's curriculum. The program indicates the quarter in which it would be desirable to take the recommended courses, although the courses might be taken in other quarters. This program should be planned not later than the sophomore year. Such students will remain in one of the regular subject matter curricula.
FOREIGN TRADE AND SERVICE

Fall Quarter Credits Winter Quarter Credits Spring Quarter Credits
General Psychology Psych. 104 3 Rural Institutions and Organizations Soc. 200 4 Methods of Teaching V.Ed. 305 3
Adm. and Org. of Ext. Ed. V.Ed. 466 3 Publicity Methods T.I. 223 3 Survey of Extension Ed. V.Ed. 211B 1

Junior Year
Methods of Ext. Ed. V.Ed. 467 3 Farm Mgt. and Org. Ec. 330 4

Senior Year
Audio-Visual Methods in Ed. V.Ed. 560 3 Business Correspondence Engl. 404 2

Juniors, seniors and well-qualified sophomores may gain experience by working as assistants to county extension directors or to county extension youth assistants during the summer months.

Preparation for Graduate Study

The student who expects to earn an advanced degree in an area of technical agriculture should take some of the more fundamental courses indicated below. In addition to these strongly recommended courses, students will find calculus, physical chemistry, genetics, bacteriology, botany and zoology to be valuable. The student should consult his adviser in determining the extent to which he might substitute these fundamental courses for the more applied courses required in his curriculum.

A knowledge of statistics and the principles of technical writing are essential in the preparation of a thesis, which is required for the Master of Science or Doctor of Philosophy degree in Agriculture. Graduate students are usually required to have a reading knowledge of French or German before the Master’s degree can be conferred; they must have a reading knowledge of both languages before the Doctor’s degree can be conferred.

Junior Year
Method of Teaching V.Ed. 305 3
Survey of Extension Ed. V.Ed. 211B 1

Preparation for Foreign Trade and Service

There is a rapidly growing demand for agriculturally-trained men in foreign assignments, both as representatives of the United States Government and as representatives of American business enterprises. The qualifications for such employees are that they be deeply interested in agriculture and that they have several years’ experience in agricultural work in addition to a college program prepared to fit them for foreign responsibilities.

College preparation for foreign trade and service is offered at Iowa State College. Two types of training for Foreign Trade and Service are available to students working toward a degree in Agriculture or a joint degree in Agriculture and Science.

1. Bachelor of Science Degree in any of the four-year curricula in the Division of Agriculture with electives designed to prepare the students for such examinations as may be required by the Department of State for individuals interested in becoming Agricultural Attaches or serving in similar foreign assignments.
The following courses are to be used in filling the elective credits allowed in the various curricula: M.L. 201, 202, 203, 301, 302, (French); Engl. 414; Geol. 200; Soc. 425; Hist. 211, 212, 213 and Psych. 104.

Students who desire to prepare for employment in (1) the foreign trade section of a business; (2) government foreign service; (3) use of technical training abroad in connection with either business or government should, not later than the end of their freshman year, seek the advice of their advisers relative to the proper choice of electives and the substitution of some or all of the following courses for an equivalent number of credit hours in courses required in their curricula; Ec. 455, 541; Govt. 446; Hist. 555, 568, and Stat. 201.

2. Dual degree in both Agriculture and Science.

A minimum of 243 credits is required for the Bachelor of Science degree in two divisions. Such students will be required to take the program prescribed for the Major in Foreign Trade and Service, plus those 39 credits in agriculture referred to, should a Science Division major elect agriculture as his area of concentration. See page 97 under the Major in Foreign Trade and Service in the Division of Science section of the catalog. In addition the following courses must be included in the student's program either as electives or through substitution for required courses: A.E. 254; Ec. 330; Agron. 206, 234, 473, 514; A.H. 216; D.F.I. 114; Hort. 415; P.H. 101; V.Ed. 204, and Zool. 274.

Comprehensive Regional and Town Planning Courses

Recent developments in extending local as well as national governmental activities are creating a need for technically trained men to cooperate with others in planning on a broad and comprehensive basis. Some of the immediate problems are: land and water utilization; housing; zoning; transportation; public health; conservation; recreation; agricultural engineering site planning; technological coordination. See Urban Planning Option, page 57.

Special sequences in planning courses are available to students in the Divisions of Agriculture, Engineering and Science, as exemplified in the Departments of Agronomy, Architecture and Civil Engineering, Economics and Sociology, Landscape Architecture and Vocational Education.

Students interested in the application of their special techniques to comprehensive and collaborative planning programs and projects in regional or town planning, and who have a quality point average of 2.50 or higher, should consult with their heads of departments or advisers, and the Chairman, Mr. Fitzsimmons, of the special faculty collaborative planning committee.

Division of Engineering

J. F. Downie Smith, Sc.D., Dean of Division of Engineering
104 Marston Hall

John E. Lagerstrom, M.S., Assistant to the Dean
104 Marston Hall

Mervin S. Cover, E.E., Administrative Assistant
113 Marston Hall

The Division of Engineering, organized about 1896 with four departments, now has eleven degree-granting departments, an Engineering Experiment Station, and an Engineering Extension Service. Its faculty includes all of the members of the staffs of the eleven departments, the Experiment Station and the Extension Service. The several curricula included in the division and the dates of their establishment are: Civil and mechanical engineering, 1868 (when the college first opened), electrical engineering, 1891, mining engineering, 1894, ceramic engineering, 1906, chemical engineering and agricultural engineering, 1909, architectural engineering, 1914, general engineering, 1926 (discontinued, 1956), aeronautical engineering, 1942, architecture, 1944 and industrial engineering, 1956
The courses in theoretical and applied mechanics were brought into an organized department in 1931, and those in engineering drawing, in 1935. The Engineering Experiment Station was established in 1904, and the Engineering Extension Service was established in 1913.

Professional Degrees. The professional degrees in engineering are granted by Iowa State College to alumni whose engineering experience has qualified them to perform engineering work of an exacting professional character. The professional degrees authorized are: Agricultural Engineer, Architectural Engineer, Ceramic Engineer, Chemical Engineer, Civil Engineer, Electrical Engineer, Industrial Engineer, Mechanical Engineer, Engineer of Mines. A detailed statement of the requirements for the professional degrees in engineering may be secured by writing to the Dean of Engineering.

Opportunities for Engineering Graduates. Engineers are employed in industries that make use of technological processes, in government service, and in a wide variety of general business fields. The readiness with which they secure the first job varies with the state of business in the country as in other lines of endeavor. In recent years most of the graduating engineers have found employment without difficulty, many of them in organizations affording an opportunity to advance to positions of considerable administrative and technical responsibility.

In all the states except one, registration as a professional engineer is required for many types of positions. One prerequisite to registration is graduation from an accredited curriculum in engineering. The curricula at Iowa State College are officially accredited. Generally, professional experience of two or more years is required for registration, and during this two-year period it is possible in many states for the engineer to secure a certificate as an "engineer-in-training." This rating may be secured by examination at graduation time and will continue for a reasonable period while the engineer is gaining experience. The college provides its graduating engineers with complete information about registration as an engineer-in-training and as a professional engineer.

Personnel Service. The Division of Engineering has an effective placement service. The primary function of this service is to bring to Iowa State College the representatives of those industrial and commercial organizations that regularly recruit personnel from among the graduates of the engineering college. The Engineering Personnel Office makes the necessary arrangements for the students of the several engineering departments to interview these representatives and aids the students in preparing for such interviews. This service is available to each member of the graduating class, to the alumni who desire to change positions, and to those undergraduates who plan to stay out of college for a time or who seek industrial experience during vacation periods.

Honor Fraternities. Tau Beta Pi is a national honorary engineering society maintaining a chapter on the Iowa State College campus. A chapter of Eta Kappa Nu chooses its membership from students in electrical engineering, Keramos from students in ceramic engineering, Pi Tau Sigma from students in mechanical engineering, Sigma Gamma Tau from students in aeronautical engineering, and Tau Sigma Delta from those in architecture and architectural engineering. Among the other honor fraternities open to students in the Division of Engineering are the following:

Sigma Xi.................................All College........Men and Women
Phi Kappa Phi...........................All College........Men and Women
Cardinal Key............................All College........Men
Phi Lambda Upsilon ...................Chemistry........Men

Engineering and Architectural Societies. General professional association and advancement are promoted by the activities of the student branches of the great national engineering and architectural societies of which the following are represented at Iowa State College: American Ceramic Society, American Institute of Electrical Engineers, American Society of Agricultural Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Chemical Engineers, American Institute of Mining and Metallurgical Engineers, Institute of the Aeronautical Sciences, Society for the Advancement of Management and American Institute of Architects.

The Engineering Council is the governing body of the student organizations in the Division of Engineering. The council is made up of delegates representing all the de-
partmental student technical societies and directs certain activities that are carried out by the student body. Among these are the Engineering Carnival, in the fall, the Engineering Open House, every spring, and engineering social affairs. The council each year invites a few prominent engineers to visit the college and address the students on subjects of general interest to the profession.

The Iowa Engineer. The engineering students publish monthly during the college year an engineering journal called *The Iowa Engineer*. Articles are contributed by engineering alumni, nonresident engineering lecturers, and members of the engineering faculty, as well as by the student editors and reporters. Engineering journals are becoming so numerous and important that experience on *The Iowa Engineer* staff is very valuable.

**Awards**


**Alpha Chi Sigma Awards.** Value: Fee for a junior membership in the American Chemical Society to the highest ranking male graduating senior in Chemical Engineering, Chemical Technology or in Science, major in Chemistry. Chemistry handbooks to the two male sophomores in Chemical Engineering or Chemical Technology who have attained the highest scholastic records.

**American Society of Agricultural Engineers Award.** For a Senior. Value: Fee for Junior membership in the American Society of Agricultural Engineers. Qualifications: Honor student in the curriculum of Agricultural Engineering.

**General Filter Company Awards in Sanitary Engineering.** For Undergraduates. Value: $300 in amounts of $50 or $100 quarterly; $100 only to those students intending to follow a career in sanitary engineering. Qualifications: Interest and aptitude for special studies in sanitary engineering, sanitary bacteriology or sanitary chemistry; intention to follow a career in sanitary engineering.


**Iowa Engineer Awards.** For Undergraduates. Value: Two for $25 each. Qualifications: Best technical article, and best non-technical article written by students and published in the Iowa Engineer during the past year.

**Iowa Section of American Civil Engineers Award.** For a Senior. Value: $10 in payment of Junior Membership to Iowa Section of the American Society of Civil Engineers. Qualifications: Service to student chapter, promise of success as an engineer; scholarship.


**Tau Beta Pi Award.** For a Freshman. Value: $5. Qualifications: Highest scholastic average in the first two quarters of the freshman year in engineering.

**Architectural Awards and Prizes**

**Alpha Rho Chi Medal.** To the graduating Senior in Architecture. Qualifications: Ability for leadership, willing service for his school and department; promise of real professional merit through his attitude and personality.

**Charles Frederick Bowers Memorial Prize.** For a Senior. Value: Approximately $60. Qualifications: Outstanding senior student in the curriculum in Architectural Engineering.

**American Institute of Architects' School Medal and Henry Adams Book Award.** To a Fifth-year Architecture Student. Value: A medal and a book to the fifth year student who has achieved the highest scholastic standing and demonstrated excellence in his professional work. A book to the second-place student.
LEO A. DALY AWARD. For Undergraduates. Value: $250. Qualifications: Demonstration, by academic work and related activities, of promise of high level performance in one or more of the branches of building design.


KARL KEFFER AWARD. For Undergraduates. Value: $100. Qualifications: Demonstration, by academic work and related activities, of promise of high level performance in and great enthusiasm toward the professional practice of architecture. Established in 1952 by Karl Keffer.

C. W. SHIREY PRIZE. For Seniors in Architectural Engineering and Civil Engineering. Value: $150. Qualifications: Essay or design competition showing attention, ability and imagination toward solving current problems of the art and science of construction, making full use of all current knowledge in this field. Established in 1955 by the C. W. Shirey Company, Waterloo, Iowa.

Scholarships

Applications for all scholarships, awards and aid funds made by students in the Division of Engineering must be made in triplicate and submitted to department heads by March 15. Application blanks are available in the various departmental offices.


ALCOA ENGINEERING SCHOLARSHIPS. For Undergraduates. Value: Three for $200 each. Qualifications: Scholarship, leadership, financial need. Candidates must be from the State of Iowa. Established by the Aluminium Company of America. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

AMERICAN ARCHITECTURAL FOUNDATION SCHOLARSHIP. For Undergraduates in Architecture. Value: $300. Qualifications: Must be in accredited schools; financial need. Established by the National Board of Fire Underwriters. Apply to: Committee on Awards and Scholarships, American Institute of Architects, 1735 New York Avenue, N.W., Washington 6, D. C.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, Inc. SCHOLARSHIP. For Freshmen in Civil and Architectural Engineering. Value: $1,000. Qualifications: Open to any boy or girl, whose secondary school scholastic record is adequate to admit him or her to one of the colleges accredited by the Engineers' Council for Professional Development. An essay and college entrance board tests are required. Established in 1955 by the American Institute of Steel Construction, Inc. Apply to: Scholarships and Awards Committee, 101 Building H.

ARCHER-DANIELS-MIDLAND COMPANY SCHOLARSHIP. For a Senior in Chemistry or Chemical Engineering. Value: $500. Qualifications: Scholarship. Consideration is also given to leadership, character, personality and amount of college expenses earned by the student. Established by the Archer-Daniels-Midland Company. Apply to: Departments of Chemistry or Chemical Engineering.

ASSOCIATED GENERAL CONTRACTORS OF IOWA SCHOLARSHIP. For a Senior. Value: $500. Qualifications: Scholarship, personality, promise of professional achievement in engineering construction. Established by the Associated General Contractors of Iowa. Apply to: Civil Engineering Department.

CARBIDE AND CARBON CORPORATION SCHOLARSHIP. For a Senior. Value: Registration and tuition fees, plus $200. Qualifications: Scholarship. Consideration is also given to leadership, character, personality and amount of college expenses earned by the student. Established by the Union Carbide and Carbon Corporation, Whiting, Indiana. Apply to: Mechanical and Chemical Engineering Departments.

CEDAR RAPIDS ENGINEERING CLUB SCHOLARSHIPS. For Freshmen. Value: Two for $200 each. Qualifications: Must be a graduate of one of the high schools in the Cedar Rapids and Marion areas who cannot enroll in an engineering college without financial assistance. Established by the Cedar Rapids Engineers' Club. Apply to: Cedar Rapids Engineers' Club, Cedar Rapids, Iowa.
CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD SCHOLARSHIP. For Undergraduate student employee or employee's son of the Chicago, Rock Island and Pacific Railroad Company. Value: $500 a year for each of four years while at college. Qualifications: Employee or employee’s son of high scholastic ability and personality. Must maintain a high scholastic average while in school. Established by the Chicago, Rock Island and Pacific Railroad Company. Apply to: The Chicago, Rock Island and Pacific Railroad Company.

DOUGLAS AIRCRAFT COMPANY SCHOLARSHIP. For a Senior. Value: $750. Qualifications: Outstanding senior in Aeronautical, Mechanical or Electrical Engineering, preferably in that order, who can best benefit by this financial assistance. Established by the Douglas Aircraft Company. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

DOW CORNING ELECTRICAL INSULATION SCHOLARSHIP. For a Junior. Value: $500. Qualifications: Character, leadership and personality which indicate future professional success; scholarship, financial need. Applications, together with original paper on electrical insulation (500-1500 words), are sent to Dow Corning Corporation for review and are returned to Scholarships and Awards Committee, who selects the recipient. Apply to: Electrical Engineering Department.

ENGINEERS' CLUB OF DES MOines SCHOLARSHIP. For a Freshman. Value: $150. Qualifications: Student must be a graduate of one of the five high schools in Des Moines, who would not otherwise enroll as an engineering student without financial assistance; must be outstanding in scholarship. Established by the Engineer’s Club of Des Moines. Apply to: Engineers’ Club of Des Moines, Des Moines, Iowa.

FISHER FOUNDATION SCHOLARSHIPS. For Undergraduates. Value: Ten for $200 each. Qualifications: Must be worthy students enrolled in Chemical, Electrical, Mechanical or Nuclear Engineering. Established by the Fisher Foundation of the Fisher Governor Company, Marshalltown, Iowa. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

ALMON H. FULLER SCHOLARSHIP. For a Senior. Value: $300. Qualifications: Must be in Civil Engineering, and have limited financial resources. His scholarship, activities, professional interest and aptitude should give promise of greater scholastic and professional growth if relieved of some of the burden of self-support. Established by Alfred W. Warren, a graduate of Iowa State College. Apply to: Civil Engineering Department.

GARDNER-DENVER FOUNDATION SCHOLARSHIP. For a Junior. Value: $600. Qualifications: Scholarship, character, outstanding technical and administrative potential, extracurricular activities, financial need. Established in 1956 by the Gardner-Denver Foundation. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

MASTER BUILDERS OF IOWA SCHOLARSHIP. For a Junior or a Senior. Value: $500. Qualifications: Worthy student enrolled in Architectural Engineering, who may not otherwise be able to complete his course, and who plans to enter the building construction field after graduation. Apply to: Architecture Department.

THE MAYTAG SCHOLARSHIP IN ENGINEERING. For a Senior. Value: $200. Qualifications: Scholarship, leadership, character, personality and financial need. Established by the Maytag Company Foundation, Inc. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

MISSOURI VALLEY STEEL COMPANY SCHOLARSHIP. For a Freshman. Value: $500. Qualifications: Must be a graduate of an Iowa or Nebraska high school, and one whose character, leadership and academic accomplishments point toward success in the field of engineering. Established in 1956 by the Missouri Valley Steel Company, Sioux City, Iowa. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

MONSANTO CHEMICAL COMPANY SCHOLARSHIP. For a Freshman and a Senior. Value: $250 each. Qualifications: Must be a Chemical Engineering major. Scholarship, personal qualifications, financial need. Established in 1953 by the Monsanto Chemical Company, St. Louis, Missouri. Apply to: Chemical Engineering Department.

COLONEL ROBERT H. MORS Foundation SCHOLARSHIPS. For Juniors and Seniors. Value: $500 each. Qualifications: Must be Mechanical or Electrical Engineering majors. Scholarship, character, personality, campus activities. Established by Col. Robert H.
ENGINEERING

Morse in memory of John Morse. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

National Association of Manufacturers Scholarships. For Sophomores. Value: $1,000. Qualifications: Must be currently engaged in a course of study leading to a bachelor's degree in one of the major fields of business administration, science, engineering or mathematics; must plan to enter the teaching profession upon completion of his undergraduate program. Prime consideration will be the financial need. Established in honor of the retiring president of the National Association of Manufacturers, and is offered in recognition of the teaching profession. Apply to: Scholarships and Awards Committee, 101 Building H.

National Carbon Company Scholarship. For a Senior in Mechanical Engineering. Value: Tuition and registration fees plus $200. Qualifications: Scholarship, character, promise of professional achievement, financial need, participation in activities. Established by the National Carbon Company. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

Paxton & Vierling Steel Company Scholarship. For a Freshman. Value: $500. Qualifications: Financial need of an Iowa or Nebraska high school student, whose character, leadership and academic accomplishments point toward success in the field of engineering. Established in 1956 by the Paxton & Vierling Steel Company, Omaha, Nebraska. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.


Socony Mobil Oil Company Scholarship. For a Junior or a Senior. Value: Not more than $800. Qualifications: Major in Chemical Engineering. Scholarship, extra-curricular activities, previous full-time, part-time or temporary employment; financial need; personal characteristics. Established by the Socony Mobil Oil Company. Apply to: Chemical Engineering Department.

Square D Scholarships. For Juniors and Seniors. Value: $450. Qualifications: Must be majoring in Electrical, Mechanical, Industrial Engineering. Must be in the upper two-fifths of his class. Leadership, personality, diversified interests, high integrity, moral character, financial need. Established by the Square D Company of Detroit, Michigan. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

Standard Oil Company of Ohio Scholarship. For a Junior or a Senior. Value: Not more than $800. Qualifications: Major in Chemical Engineering. Scholarship, extra-curricular activities, previous full-time, part-time or temporary employment; financial need; personal characteristics. Established by the Standard Oil Company of Ohio. Apply to: Chemical Engineering Department.

Structural Clay Products Institute Scholarship. For a Sophomore. Value: Three for $200 each. Qualifications: Must be majoring in Ceramic Engineering. Scholarship, good personal characteristics, active in campus affairs. Must write an acceptable paper on "Ceramic Engineering, a Career with a Future." Established by the Structural Clay Products Institute, Region Six. Apply to: Ceramic Engineering Department.

Trane Company Scholarships. For Seniors. Value: Two for $500 each. Qualifications: Major in Mechanical or Industrial Engineering. Scholarship, character, promise of professional achievement, participation in activities, financial need. Established in 1956 by the Trane Company, La Crosse, Wisconsin. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

Universal Oil Products Company Scholarships. For a Senior. Value: $1,000. Qualifications: Scholarship, leadership, character and personality. Established by the Universal Oil Products Company. Apply to: Chemical Engineering Department.

Western Electric Scholarship. For Undergraduates. Value: Varies between $280 and $490. Qualifications: Must be a citizen of the United States. Financial need and ability are prime considerations. Established by the Western Electric Company. Apply to: Scholarships and Awards Committee, Division of Engineering, 104 Marston Hall.

Curricula in Engineering

Objectives

Engineering education is distinctive in that its aim is to develop a type of thinking that is objective and analytical. It requires a sound knowledge of English, of the broad basic sciences of chemistry, physics, mathematics and economics, and of the specialized branches of these sciences peculiar to a particular field of engineering. The training is characterized by practice in analyzing and solving problems and situations of a nature common in professional engineering. Since engineers deal with problems involving human relations as well as the materials and forces of nature, the several engineering curricula allocate about one-fourth of the time of the student to courses in psychology, sociology, economics, history, literature, government and law. Special attention is devoted to development of the ability of the student to write and speak well.

The curricula in engineering at Iowa State College have been adjusted recently to permit a more thorough training in the outlined four years in the basic sciences and professional engineering courses, and to increase the subject matter to some degree in the humanities. The broad objectives of the engineering curricula is to develop the student to professional competence in one of the fields of engineering and by breadth of training to enable him to participate as a leader in the affairs of his profession and his community, the state, and the nation.

More advanced work in the engineering sciences and their application to engineering are offered in the postgraduate programs of the several departments. For details of graduate study in engineering, prospective students are referred to the Graduate College Catalog.

Organization of Curricula

The basic sciences constitute about one-third of the program and are taught principally in the freshman and sophomore years, but the student establishes and maintains contact with engineering courses from his first quarter of school work. The applied science and engineering courses are for the most part concentrated in the last two years of the curricula. A distinctive feature of all of the engineering curricula at Iowa State College is that an early foundation in mathematics permits the teaching of more rigorous courses in the physical sciences, which are at the foundation, and which strengthen the entire four-year program.

Prerequisites to Engineering

One unit of geometry and one and one-half units of algebra are required. Students who have not completed all of these courses may take geometry or third semester algebra at Iowa State College.

Additional courses in high school mathematics are strongly recommended, as well as three or four units of English and all of the science courses available in the high school.

Every student should plan his mathematics sequence with his adviser's assistance at the earliest opportunity in order to minimize the time required to become eligible for the sequence courses of the sophomore year.
# Freshman Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>General Chemistry</td>
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<td>General Chemistry</td>
<td>4</td>
<td>General Chemistry</td>
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<tr>
<td>Chem. 101</td>
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<td>Chem. 102</td>
<td></td>
<td>Chem. 103</td>
<td></td>
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<tr>
<td>Drawing &amp; Projection</td>
<td>3</td>
<td>Graphical Theory &amp; Application</td>
<td>3</td>
<td>Working Drawings &amp; Applied Graphics</td>
<td>3</td>
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<tr>
<td>E.Dr. 131</td>
<td></td>
<td>E.Dr. 132</td>
<td></td>
<td>E.Dr. 133</td>
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<tr>
<td>Prin. of Composition</td>
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<td>Prin. of Composition</td>
<td>3</td>
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<tr>
<td>Engl. 101</td>
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<td>Engl. 102</td>
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<td>Engl. 103</td>
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<td>Engineering Problems</td>
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<tr>
<td>I.E. 104</td>
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<td>I.E. 105</td>
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<td>I.E. 106</td>
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<td>College Algebra*</td>
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<td>Plane Trigonometry</td>
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<td>Math. 103</td>
<td>5</td>
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<td>Math. 101</td>
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<td>Math. 102G</td>
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<td>Math. 103</td>
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<td>2Military Science</td>
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<td>2Military Science</td>
<td>1</td>
<td>2Military Science</td>
<td>1</td>
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<tr>
<td>or</td>
<td></td>
<td>or</td>
<td></td>
<td>or</td>
<td></td>
</tr>
<tr>
<td>3Naval Science</td>
<td>3</td>
<td>Naval Science</td>
<td>3</td>
<td>Naval Science</td>
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<td>N.S. 112</td>
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<td>N.S. 113</td>
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<td><strong>NROTC Students</strong></td>
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<td><strong>NROTC Students</strong></td>
<td><strong>16</strong></td>
<td><strong>NROTC</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will include in his schedule: Physical education, Libr. 106C (Winter); Engr. 114, 115; Departmental Lecture 100 (Spring).

A student who transfers to an engineering curriculum after having completed Math. 103 shall take in the first term of his work in engineering I.E. 108 in lieu of I.E. 105, 105 and 106. A student who transfers to an engineering curriculum with junior classification is not required to take I.E. 104, 105, 106 or 108, but his adviser may advise him to take I.E. 108.

### SELECTION OF CURRICULUM BY THE STUDENT

The program of the freshman year is similar for all curricula in the Division of Engineering, and entering freshmen are not required to select the curriculum they wish to follow until near the end of the freshman year. For exceptions see footnotes below.

The student can change his curriculum up to the end of the sophomore year without much loss of credit. To do so he needs only to secure the consent of the Dean of Engineering and to comply with the faculty rules relating to such changes.

Engineering students who wish to elect a sequence in technical journalism may arrange such a program upon approval of the head of the student's engineering department and the head of the department of Technical Journalism. See page 228 for description of courses.

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2May be omitted by students appointed to NROTC.

*May be taken only by students appointed to NROTC.

*Architecture and Architectural Engineering students will take E.Dr 131A, Cr. 3, Fall; E.Dr. 132A, Cr. 3, Winter; Arch. 103, Cr. 3, Spring.

+Students who show sufficient proficiency in mathematics, as determined by the Mathematics Department may progress more rapidly than indicated.

### Aeronautical Engineering

Leading to the degree of Bachelor of Science.

For freshman year, see above.

# Sophomore Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Aeronautics</td>
<td>2</td>
<td>Aircraft Materials and Construction</td>
<td>3</td>
<td>Aircraft Instruments</td>
<td>2</td>
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<tr>
<td>Prin. of Economics</td>
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<td>Prin. of Economics</td>
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<td>Diff. &amp; Int. Calc. 111</td>
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<tr>
<td>Ec. 241</td>
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<td>Ec. 242</td>
<td></td>
<td>Math. 213</td>
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<tr>
<td>Diff. and Int. Calc. 1</td>
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<td>Diff. &amp; Int. Calc. 11</td>
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<td>General Physics</td>
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<tr>
<td>Math. 211</td>
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<td>Math. 212</td>
<td></td>
<td>Phys. 223</td>
<td></td>
</tr>
<tr>
<td>General Physics</td>
<td>5</td>
<td>Machine Shop</td>
<td>4</td>
<td>Speech-Making</td>
<td>3</td>
</tr>
<tr>
<td>Phys. 221</td>
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<td>M.E. 201</td>
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<td>Sp. 311</td>
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<tr>
<td>Physical Metallurgy</td>
<td>3</td>
<td>General Physics</td>
<td>2</td>
<td>Statics of Engineering</td>
<td>4</td>
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<tr>
<td>M.E. 211</td>
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<td>Phys. 222</td>
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<td>T.A.A.M. 274</td>
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<td><strong>1Military Science</strong></td>
<td><strong>18</strong></td>
<td><strong>1Military Science</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include physical education in his schedule.

*These courses may be replaced by Naval Science courses.
### Fall Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeronautical Problems</td>
<td>3</td>
</tr>
<tr>
<td>Circuits &amp; Machines</td>
<td>5</td>
</tr>
<tr>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Dynamics of Engr.</td>
<td>4</td>
</tr>
<tr>
<td>2, Electives</td>
<td>3</td>
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<tr>
<td><strong>Total</strong></td>
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### Winter Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
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<tr>
<td>Math. 314</td>
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<tr>
<td>Materials Lab.</td>
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<tr>
<td>Materials of Fluids</td>
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<tr>
<td><strong>Total</strong></td>
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### Spring Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Aerodynamics 1</td>
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<tr>
<td>Stress Analysis 1</td>
<td>3</td>
</tr>
<tr>
<td>Mechanics of Fluids</td>
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<tr>
<td>Thermodynamics</td>
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<tr>
<td><strong>Total</strong></td>
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#### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Stability &amp; Control</td>
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</tr>
<tr>
<td>Aircraft Propulsion B</td>
<td>3</td>
</tr>
<tr>
<td>Stability of Aircraft Struct.</td>
<td>4</td>
</tr>
<tr>
<td>Aircraft Design</td>
<td>4</td>
</tr>
<tr>
<td>Aircraft Vibration &amp; Flutter</td>
<td>4</td>
</tr>
<tr>
<td>Military Science</td>
<td>4</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Aero. Seminar, Aero.E. 491, 492, 493 and Senior Inspection Trip, Aero.E. 400 (Fall).

2These courses may be replaced by Air, Military or Naval Science courses.

### Curriculum in Agricultural Engineering

Administered jointly by the Division of Agriculture and the Division of Engineering.

Leading to the degree of Bachelor of Science.

Six months of practical work in agriculture or engineering under the direction of this department is required before graduation.

For freshman year, see page 67.

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Machines</td>
<td>3</td>
</tr>
<tr>
<td>Livestock Feeding &amp; Management</td>
<td>3</td>
</tr>
<tr>
<td>Surveying</td>
<td>3</td>
</tr>
<tr>
<td>Diff. &amp; Integral Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>Military Science</td>
<td>3</td>
</tr>
<tr>
<td>Naval Science</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agr. Applications of Electrical Energy</td>
<td>3</td>
</tr>
<tr>
<td>D.C. Circuits &amp; Mach.</td>
<td>4</td>
</tr>
<tr>
<td>Diff. Equations</td>
<td>3</td>
</tr>
<tr>
<td>Mech. of Materials</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

### Additional Notes

1May be taken only by students appointed to the NROTC.
2May be omitted by students appointed to advanced ROTC and NROTC.
3In the junior and senior years the student will elect one of the optional groups on page 69 and will take all of the courses listed in such group.
## Senior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil &amp; Water Cons.</td>
<td>4</td>
<td>Applications of Electrical Prin.</td>
<td>4</td>
<td>A.E. Applications</td>
<td>3</td>
</tr>
<tr>
<td>Agricultural Structures</td>
<td>4</td>
<td>A.E. 461</td>
<td></td>
<td>Environmental Control</td>
<td>3</td>
</tr>
<tr>
<td>Agr. 475</td>
<td></td>
<td>in Agr. Struct.</td>
<td></td>
<td>A.E. 488</td>
<td></td>
</tr>
<tr>
<td>Principles of Economics</td>
<td>3</td>
<td>Principles of Economics</td>
<td>3</td>
<td>Farm Mgmt. &amp; Org.</td>
<td>4</td>
</tr>
<tr>
<td>Ec. 241</td>
<td></td>
<td>Ec. 330</td>
<td></td>
<td>Ec. 335</td>
<td></td>
</tr>
<tr>
<td>Engineering Contracts</td>
<td>3</td>
<td>Technical Electives</td>
<td>10</td>
<td>Technical Electives</td>
<td>5</td>
</tr>
<tr>
<td>I.E. 480</td>
<td></td>
<td></td>
<td></td>
<td>Electives</td>
<td>5</td>
</tr>
<tr>
<td>&amp; Technical Electives</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18 or 20

In addition to the courses listed above, each student will be required to include in his schedule: Inspection Trip, A.E. 400 (Fall); Seminar, A.E. 401, 402, 403.

2# Technical Electives: In the junior and senior years the student will elect one of the following optional groups and take all of the courses listed in such group:

### Farm Power and Machinery
- Machine Shop, M.E. 201: 2 Credits
- Kinematics, M.E. 310: 3 Credits
- Machine Analysis M.E. 312: 5 Credits
- Design of Machine Elements M.E. 315: 5 Credits
- Agr. Machinery Design A.E. 488: 4 Credits

### Soil and Water Conservation
- Selection of Agr. and Water Conservation, C.E. 335: 5 Credits
- Reinforced Concrete Structures C.E. 437: 5 Credits
- Heat Transfer M.E. 325: 3 Credits
- Refrig. & Air Cond. M.E. 426: 4 Credits
- Advanced Agricultural Structures A.E. 476: 4 Credits

In addition to the courses listed above, each student will be required to include physical education in his schedule.

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### Curriculum in Architecture

Leading to the degree of Bachelor of Architecture.

For freshman year, see page 67.

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
<th>Junior Year</th>
<th>Credits</th>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis I</td>
<td>Analysis I</td>
<td>Analysis I</td>
<td>Analysis I</td>
<td>Analysis I</td>
<td>Analysis I</td>
</tr>
<tr>
<td>Arch. 201</td>
<td>Arch. 202</td>
<td>Arch. 203</td>
<td>Arch. 204</td>
<td>Arch. 205</td>
<td>Arch. 206</td>
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<tr>
<td>Principles of</td>
<td>Principles of</td>
<td>Principles of</td>
<td>Principles of</td>
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<td>Principles of</td>
</tr>
<tr>
<td>Economics</td>
<td>Economics</td>
<td>Economics</td>
<td>Economics</td>
<td>Economics</td>
<td>Economics</td>
</tr>
<tr>
<td>Ec. 241</td>
<td>Ec. 311</td>
<td>Ec. 324</td>
<td>Ec. 325</td>
<td>Ec. 326</td>
<td>Ec. 327</td>
</tr>
<tr>
<td>D.T.A.M. Calculus I</td>
<td>Diff. &amp; Int. Calculus II</td>
<td>Diff. &amp; Int. Calculus III</td>
<td>Diff. &amp; Int. Calculus IV</td>
<td>Diff. &amp; Int. Calculus V</td>
<td>Diff. &amp; Int. Calculus VI</td>
</tr>
<tr>
<td>General Physics</td>
<td>General Physics</td>
<td>General Physics</td>
<td>General Physics</td>
<td>General Physics</td>
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<tr>
<td>Air Science</td>
<td>Air Science</td>
<td>Air Science</td>
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<td>Air Science</td>
<td>Air Science</td>
</tr>
<tr>
<td>or</td>
<td>or</td>
<td>or</td>
<td>or</td>
<td>or</td>
<td>or</td>
</tr>
<tr>
<td>Military Science</td>
<td>Military Science</td>
<td>Military Science</td>
<td>Military Science</td>
<td>Military Science</td>
<td>Military Science</td>
</tr>
<tr>
<td>N.S. 211</td>
<td>N.S. 212</td>
<td>N.S. 213</td>
<td>N.S. 214</td>
<td>N.S. 215</td>
<td>N.S. 216</td>
</tr>
</tbody>
</table>

1May be omitted by students appointed to advanced ROTC and NROTC.

---

1May be taken only by students appointed to NROTC.
## Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch. Design III</td>
<td>7</td>
</tr>
<tr>
<td>Arch. 416</td>
<td></td>
</tr>
<tr>
<td>Hist. of Arch. &amp; the Related Arts</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 461</td>
<td></td>
</tr>
<tr>
<td>Elements of Structures</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 335</td>
<td></td>
</tr>
<tr>
<td>2 American Government Govt. 315</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits:** 18

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## Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch. Design III</td>
<td>7</td>
</tr>
<tr>
<td>Arch. 419</td>
<td></td>
</tr>
<tr>
<td>Hist. of Arch. &amp; the Related Arts</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 462</td>
<td></td>
</tr>
<tr>
<td>Reinforced Concrete Structures</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 437</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 18

## Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch. Design III</td>
<td>7</td>
</tr>
<tr>
<td>Hist. of Arch. &amp; the Related Arts</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 463</td>
<td></td>
</tr>
<tr>
<td>Statically Indeterminate Structures I</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 438</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 18

## Junior Year

### Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and Analysis of Arch. Structure II</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 313</td>
<td></td>
</tr>
<tr>
<td>Hist. of Arch.</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 351</td>
<td></td>
</tr>
<tr>
<td>Introd. to Western Civ.</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 311</td>
<td></td>
</tr>
<tr>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Math. 314</td>
<td></td>
</tr>
<tr>
<td>Statics of Engr.</td>
<td>4</td>
</tr>
<tr>
<td>T.S.A.M. 274</td>
<td></td>
</tr>
<tr>
<td>General Psych.</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 104</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 19

### Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and Analysis of Arch. Structure II</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 314</td>
<td></td>
</tr>
<tr>
<td>Hist. of Arch.</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 352</td>
<td></td>
</tr>
<tr>
<td>Introd. to Western Civ.</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 312</td>
<td></td>
</tr>
<tr>
<td>Mechanics of Materials</td>
<td>5</td>
</tr>
<tr>
<td>T.S.A.M. 324</td>
<td></td>
</tr>
<tr>
<td>Business Law</td>
<td>5</td>
</tr>
<tr>
<td>T.A. 365A</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 17

### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and Analysis of Arch. Structure II</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 315</td>
<td></td>
</tr>
<tr>
<td>Hist. of Arch.</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 353</td>
<td></td>
</tr>
<tr>
<td>Introd. to Western Civ.</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 313</td>
<td></td>
</tr>
<tr>
<td>Materials Lab.</td>
<td>3</td>
</tr>
<tr>
<td>T.S.A.M. 337</td>
<td></td>
</tr>
<tr>
<td>Engineering Materials</td>
<td>2</td>
</tr>
<tr>
<td>T.S.A.M. 354</td>
<td></td>
</tr>
<tr>
<td>General Accounting</td>
<td>3</td>
</tr>
<tr>
<td>T.A. 372A</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 18

--

## Senior Year

### Fall Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design &amp; Analysis of Arch. Structure III</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 413</td>
<td></td>
</tr>
<tr>
<td>Elements of Structures</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 335</td>
<td></td>
</tr>
<tr>
<td>Dynamics of Engr.</td>
<td>4</td>
</tr>
<tr>
<td>T.S.A.M. 344</td>
<td></td>
</tr>
<tr>
<td>Direct Current Circuits &amp; Machines</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 435</td>
<td></td>
</tr>
<tr>
<td>2 American Government Govt. 315</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits:** 18

### Winter Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design &amp; Analysis of Arch. Structure III</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 414</td>
<td></td>
</tr>
<tr>
<td>Reinforced Concrete Structures</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 437</td>
<td></td>
</tr>
<tr>
<td>Thermodynamics</td>
<td>5</td>
</tr>
<tr>
<td>M.E. 344</td>
<td></td>
</tr>
<tr>
<td>Alternating Current Circuits &amp; Machines</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 437</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 18

### Spring Quarter

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design &amp; Analysis of Arch. Structure III</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 415</td>
<td></td>
</tr>
<tr>
<td>Statically Indeterminate Structures I</td>
<td>5</td>
</tr>
<tr>
<td>C.E. 438</td>
<td></td>
</tr>
<tr>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 325</td>
<td></td>
</tr>
<tr>
<td>Mechanics of Fluids</td>
<td>4</td>
</tr>
<tr>
<td>T.S.A.M. 376</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits:** 18

--

### Curriculum in Architectural Engineering

Leading to the degree of Bachelor of Architectural Engineering.

For freshman year, see page 67.

For sophomore year, see curriculum in architecture, page 69.

---

2 May be omitted by students appointed to advanced ROTC.
### Curriculum in Ceramic Engineering

Leading to the degree of Bachelor of Science.

**For freshman year, see page 67.**

#### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic Raw Mats.</td>
<td>4</td>
<td>Winning &amp; Forming</td>
<td>4</td>
<td>Ceramic Calc. &amp; Pyrometry</td>
<td>4</td>
</tr>
<tr>
<td>Cer.E. 213</td>
<td></td>
<td>Cer.E. 214</td>
<td></td>
<td>Cer.E. 215</td>
<td></td>
</tr>
<tr>
<td>Quantitative Analysis</td>
<td>4</td>
<td>Mineralogy</td>
<td>4</td>
<td>Quantitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 211</td>
<td></td>
<td>Geol. 355</td>
<td></td>
<td>Chem. 214</td>
<td></td>
</tr>
<tr>
<td>Diff. &amp; Int. Calculus I</td>
<td>4</td>
<td>Diff. &amp; Int. Calculus II</td>
<td>4</td>
<td>Diff. &amp; Int. Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>Math. 211</td>
<td></td>
<td>Math. 212</td>
<td></td>
<td>Math. 213</td>
<td></td>
</tr>
<tr>
<td>General Physics</td>
<td>4</td>
<td>General Physics</td>
<td>4</td>
<td>General Physics</td>
<td>4</td>
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<tr>
<td>Phys. 221</td>
<td></td>
<td>Phys. 222</td>
<td></td>
<td>Phys. 223</td>
<td></td>
</tr>
<tr>
<td>Military Science or Naval Science</td>
<td>5</td>
<td>Military Science or Naval Science</td>
<td>5</td>
<td>Military Science</td>
<td>5</td>
</tr>
<tr>
<td>N.S. 211</td>
<td></td>
<td>N.S. 212</td>
<td></td>
<td>N.S. 213</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 or 20</td>
<td></td>
<td>18 or 20</td>
<td></td>
<td>18 or 20</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule:
- Physical education; Seminar. Cer. 201, 202, 203
- 3 credits may be omitted by students appointed to advanced ROTC.

#### Junior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic Colloid &amp; Phase Equilib.</td>
<td>4</td>
<td>Vitreous State</td>
<td>3</td>
<td>Cer.Engr.Operation II</td>
<td>4</td>
</tr>
<tr>
<td>Cer.E. 311</td>
<td></td>
<td>Cer.E. 312</td>
<td></td>
<td>Cer.E. 323</td>
<td></td>
</tr>
<tr>
<td>T.&amp;A.M. 274</td>
<td></td>
<td>Cer.E. 322</td>
<td></td>
<td>Govt. 315</td>
<td></td>
</tr>
<tr>
<td>Thermodynamics</td>
<td>4</td>
<td>Mechanics of Materials</td>
<td>5</td>
<td>Materials Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 344</td>
<td></td>
<td>T.&amp;A.M. 324</td>
<td></td>
<td>T.&amp;A.M. 327</td>
<td></td>
</tr>
<tr>
<td>Principles of Economics</td>
<td>5</td>
<td>Differential Equations</td>
<td>3</td>
<td>Dynamics of Engineering</td>
<td>4</td>
</tr>
<tr>
<td>Ec. 241</td>
<td></td>
<td>Math. 314</td>
<td></td>
<td>T.&amp;A.M. 344</td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
<td>2Principles of Economics</td>
<td>3</td>
<td>Heat Transfer</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ec. 242</td>
<td></td>
<td>M.E. 325</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>19</td>
<td></td>
<td>2Speech-Making</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sp. 311</td>
<td></td>
</tr>
</tbody>
</table>

| | | | | 18 | |

In addition to the courses listed above, each student will be required to include in his schedule:
- Cer.E. 301, 302, 303.
- 3 credits may be omitted by students appointed to advanced ROTC each quarter in Junior and Senior years.
### Fall Quarter Credits
- **Ceramic Industries I** 3
- **C.E. 415**
- **D.C. Circuits & Machines** 4
- **E.E. 493**
- **Elements of Structures** 5
- **C.E. 335**
- **Optical Mineralogy** 4
- **C.E. 454**
- 2Electives 3

### Winter Quarter Credits
- **Ceramic Industries II** 3
- **Cer. E. 416**
- **Development & Control**
- **Cer.E. 430**
- **Reinforced Concrete**
- **Struct.** C.E. 437
- **A.C. Circuits & Machines** 4
- **E.E. 437**
- 2Electives 3

### Spring Quarter Credits
- **Ceramic Industries III** 3
- **Cer. E. 417**
- **Cer.E. Design**
- **Cer.E. 426**
- **Writing of Scientific Papers**
- **Engl. 414**
- **Mechanics of Fluids**
- **T&A.M. 378**
- 2Electives 3

### Senior Year Credits
- Seminar, Cer.E. 401, 402, 403; Inspection Trip, Cer.E. 400 (Fall).

#### Credits
- 19

### Curriculum in Chemical Engineering

Leading to the degree of Bachelor of Science.

For freshman year, see page 67.

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Balances</td>
<td>Chem.E. 202 3</td>
</tr>
<tr>
<td>Principles of Economics</td>
<td>Chem. 241 3</td>
</tr>
<tr>
<td>Diff. &amp; Int. Calc. I</td>
<td>Math. 211 4</td>
</tr>
<tr>
<td>General Physics</td>
<td>Phys. 222 5</td>
</tr>
<tr>
<td>Military Science or N.S.</td>
<td>N.S. 211 3</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. E. Unit Operations</td>
<td>Chem. E. 362 3</td>
</tr>
<tr>
<td>Physical Chemistry Lab.</td>
<td>Chem. 320 1</td>
</tr>
<tr>
<td>Physical Chemistry</td>
<td>Chem. 322 3</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>Chem. 335 4</td>
</tr>
<tr>
<td>Differential Equations</td>
<td>Math 314 3</td>
</tr>
<tr>
<td>2Non-Tech. Electives</td>
<td>3</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. E. Unit Operations</td>
<td>Chem. E. 412 3</td>
</tr>
<tr>
<td>Physical Chemistry Lab.</td>
<td>Chem. E. 422 2</td>
</tr>
<tr>
<td>Chem. E. Design</td>
<td>Chem. E. 472 3</td>
</tr>
<tr>
<td>A.C. Circuits &amp; Machines</td>
<td>E.E. 437 4</td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

### Credits
- 18

In addition to the courses listed above, each student will be required to include在他的 schedule:
- Seminar, Chem. E. 401, 402, 403; Senior Inspection Trip, Chem. E. 400 (Fall).

### Credits
- 19

May be omitted by students appointed to advanced ROTC.

### Credits
- 19 or 20

In addition to the courses listed above, each student will be required to include physical education in his schedule.

### Credits
- 19 or 21

May be taken only by students appointed to NROTC.

### Credits
- 19 or 21

In addition to the courses listed above, each student will be required to include in his schedule:
- Seminar, Chem.E. 401, 402, 403; Inspection Trip, Chem.E. 400 (Fall).
### Curriculum in Civil Engineering

Leading to the degree of Bachelor of Science.

For freshman year, see page 67.

#### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Surveying</td>
<td>C.E. 211</td>
<td>3</td>
<td>Gen. Bacteriology</td>
<td>Bact. 304D</td>
<td>3</td>
</tr>
<tr>
<td>Geology for Engineers</td>
<td>Geol. 374</td>
<td>3</td>
<td>Top. and Cadastral Surveying</td>
<td>C.E. 212</td>
<td>3</td>
</tr>
<tr>
<td>Diff. &amp; Int. Calculus I</td>
<td>Math. 211</td>
<td>4</td>
<td>American Government</td>
<td>Govt. 315</td>
<td>3</td>
</tr>
<tr>
<td>General Physics</td>
<td>Phys. 221</td>
<td>5</td>
<td>Diff. &amp; Int. Calculus II</td>
<td>Math. 212</td>
<td>4</td>
</tr>
<tr>
<td>Speech-Making</td>
<td>Sp. 311</td>
<td>3</td>
<td>General Physics</td>
<td>Phys. 222</td>
<td>5</td>
</tr>
<tr>
<td>Military Science</td>
<td>1</td>
<td>Military Science</td>
<td>1</td>
<td>Naval Science</td>
<td>3</td>
</tr>
<tr>
<td>Naval Science</td>
<td>3</td>
<td>Naval Science</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.S. 211</td>
<td>19 or 21</td>
<td>N.S. 212</td>
<td>19 or 21</td>
<td>17 or 19</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include physical education in his schedule.

#### Junior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of Economics</td>
<td>Eco. 241</td>
<td>3</td>
<td>Soil Engineering</td>
<td>C.E. 350</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td></td>
<td>18</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, C.E. 394 (Fall) and 395 (Spring).

2 Students appointed to the NROTC will take N.S. 211, 212, 213, 3 credits each instead of Military Science.

#### Senior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply</td>
<td>C.E. 425</td>
<td>4</td>
<td>Sewage &amp; Sewage Treatment</td>
<td>C.E. 422</td>
<td>4</td>
</tr>
<tr>
<td>Reinforced Concrete Structures</td>
<td>C.E. 437</td>
<td>5</td>
<td>Statically Indeterminate Structures I</td>
<td>C.E. 438</td>
<td>5</td>
</tr>
<tr>
<td>Electrical Applications</td>
<td>E.E. 434</td>
<td>3</td>
<td>*Electives (Restricted)</td>
<td>T.S.M. 378</td>
<td>4</td>
</tr>
<tr>
<td>Economics of Ind. Relations</td>
<td>Ec. 305</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, C.E. 496 (Fall), 497 (Winter); Inspection Trip, C.E. 400 (Fall).

2 May be omitted by students appointed to advanced ROTC.

*Electives shall be chosen in social-humanistic area after consultation with adviser.
Curriculum in Electrical Engineering

Leading to the degree of Bachelor of Science.

For freshman year, see page 67.

Fall Quarter | Winter Quarter | Spring Quarter
---|---|---
Diff. & Int. Calculus Math. 211 | Diff. & Int. Calculus II Math. 212 | Statics of Engineering T.S.A.M. 274
General Physics Phys. 221 | General Physics Phys. 222 | Diff. & Int. Calculus III Math. 213
Military Science 1 | Military Science 1 | Military Science 1
Navy Science N.S. 211 | N.S. 212 | N.S. 213

Fall Quarter | Winter Quarter | Spring Quarter
---|---|---
A.C. Circuits E.E. 301 | A.C. Circuits E.E. 302 | A.C. Circuits E.E. 302
Electives 2 | Mechanical Engineering T.S.A.M. 324 | Mechanical Engineering T.S.A.M. 324

In addition to the courses listed above, each student will be required to include physical education in his schedule.

1May be taken only by students appointed to NROTC.

Junior Year

Fall Quarter | Winter Quarter | Spring Quarter
---|---|---
Thermodynamics M.E. 344 | Writing of Scientific E.E. 409 | 3A.C. Circuits E.E. 393
Technical Electives (See list below) 8 | Technical Electives (See list below) 8 | Electronics E.E. 377
Electives 3 | 2Electives Electives | Electromechanical Devices E.E. 378

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, E.E. 300 (Spring).

2May be omitted by students appointed to advanced ROTC.

3Must be selected from the humanistic-social area.

Senior Year

Fall Quarter | Winter Quarter | Spring Quarter
---|---|---
Industrial Electronics E.E. 475 | Transmission Engineering E.E. 465 | UHF Circuits E.E. 484

In addition to the courses listed above, each student will be required to include in his schedule: Inspection Trip, E.E. 400 (Fall).

1Technical electives are to be chosen from the list below.
2May be omitted by students appointed to advanced ROTC.
3Must be selected from the humanistic-social area.
Curriculum in Industrial Engineering

Leading to the degree of Bachelor of Science.

For freshman year, see page 67

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Sophomore Year</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuits &amp; Machines</td>
<td>E.E. 335</td>
<td>5</td>
<td>Circuits &amp; Machines</td>
<td>E.E. 336</td>
<td>4</td>
<td>Circuits &amp; Machines</td>
</tr>
<tr>
<td>Cost Accounting</td>
<td>I.Ad. 480</td>
<td>4</td>
<td>Calc. &amp; Graphical Methods</td>
<td>I.E. 492</td>
<td>3</td>
<td>Industrial Marketing</td>
</tr>
<tr>
<td>Industrial Organization</td>
<td>I.E. 351</td>
<td>3</td>
<td>Differential Equations</td>
<td>Math. 314</td>
<td>3</td>
<td>Time &amp; Motion Study</td>
</tr>
<tr>
<td>Dynamics of Engr.</td>
<td>T.S.A.M. 344</td>
<td>4</td>
<td>Tool Engineering</td>
<td>I.E. 305</td>
<td>3</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>Or 1Naval Science</td>
<td>N.S. 211</td>
<td>3</td>
<td>Materials Laboratory</td>
<td>T.S.A.M. 327</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>19 or 21</td>
<td></td>
<td></td>
<td>19 or 21</td>
<td></td>
<td>18 or 20</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule:
- Physical education; Seminar, I.E. 213 (Spring).
- May be taken only by students appointed to NROTC.

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>Junior Year</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. Economy</td>
<td>I.E. 404</td>
<td>3</td>
<td>Writing Scientific Papers</td>
<td>Engr. 414</td>
<td>3</td>
<td>American Government</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>I.E. 441</td>
<td>5</td>
<td>Industrial Engineering</td>
<td>I.E. 442</td>
<td>5</td>
<td>Industrial Engineering</td>
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<td>Technical Electives</td>
<td>3</td>
<td>Technical Electives</td>
<td>3</td>
<td>3</td>
<td>Technical Electives</td>
<td>3</td>
</tr>
<tr>
<td>Tech Electives</td>
<td>3</td>
<td>3</td>
<td>Electives</td>
<td>3</td>
<td>Electives</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td></td>
<td></td>
<td>17</td>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

In addition to the courses listed above, each student will be required to include in his schedule:
- Seminar, I.E. 412 (Winter); Senior Inspection Trip, I.E. 400 (Fall).
- May be omitted by students appointed to Advanced ROTC.
- May be postponed to Senior Year by advanced ROTC students.

Tech. Elect.: Three courses must be selected from the following: I.E. 407, 3 cr.; 421, 3 cr.; 462, 3 cr.; 480, 3 cr.; E.E. 439, 4 cr.; M.E. 443, 3 cr.
### Curriculum in Mechanical Engineering

Leading to the degree of Bachelor of Science.

For freshman year, see page 67.

#### Fall Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Diff. &amp; Int. Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>Engineering Metallurgy</td>
<td>5</td>
</tr>
<tr>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>Military or Air Science</td>
<td>1</td>
</tr>
<tr>
<td>Naval Science</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Sophomore Year Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of Economics</td>
<td>3</td>
</tr>
<tr>
<td>Diff. &amp; Int. Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>Engineering Metallurgy</td>
<td>5</td>
</tr>
<tr>
<td>Metal Processing</td>
<td>3</td>
</tr>
<tr>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>Military or Air Science</td>
<td>1</td>
</tr>
<tr>
<td>Naval Science</td>
<td>3</td>
</tr>
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</table>

#### Spring Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff. &amp; Int. Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>Machine Shop</td>
<td>3</td>
</tr>
<tr>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>Military or Air Science</td>
<td>1</td>
</tr>
<tr>
<td>Naval Science</td>
<td>3</td>
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#### Winter Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
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<tr>
<td>Math.</td>
<td>5</td>
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<tr>
<td>Phys.</td>
<td>2</td>
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<tr>
<td>Phys.</td>
<td>2</td>
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<tr>
<td>Phys.</td>
<td>2</td>
</tr>
<tr>
<td>Phys.</td>
<td>2</td>
</tr>
<tr>
<td>Speech-Making</td>
<td>3</td>
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</tbody>
</table>

#### Junior Year Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuits &amp; Machines</td>
<td>4</td>
</tr>
<tr>
<td>Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>Dynamics of Engineering</td>
<td>4</td>
</tr>
<tr>
<td>I.E.</td>
<td>3</td>
</tr>
<tr>
<td>Thermodynamics Lab</td>
<td>1</td>
</tr>
<tr>
<td>Mechanics of Materials</td>
<td>5</td>
</tr>
<tr>
<td>Mechanics of Materials Lab</td>
<td>1</td>
</tr>
<tr>
<td>Thermo-Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Speech-Making</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Winter Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuits &amp; Machines</td>
<td>4</td>
</tr>
<tr>
<td>Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>Mechanics of Materials</td>
<td>5</td>
</tr>
<tr>
<td>Hamiltonian Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>Mechanical Laboratory</td>
<td>3</td>
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<tr>
<td>Technical Electives</td>
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</tbody>
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#### Spring Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing of Sci. Papers</td>
<td>3</td>
</tr>
<tr>
<td>Hist. of the U.S.</td>
<td>3</td>
</tr>
<tr>
<td>Behavor of Metals</td>
<td>3</td>
</tr>
<tr>
<td>Non-technical Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Senior Year Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuits &amp; Machines</td>
<td>4</td>
</tr>
<tr>
<td>Design of Machine Elements</td>
<td>3</td>
</tr>
<tr>
<td>Inspection Trip</td>
<td>4</td>
</tr>
<tr>
<td>Refrig. &amp; Air Conditioning</td>
<td>4</td>
</tr>
<tr>
<td>Fuels &amp; Combustion</td>
<td>4</td>
</tr>
<tr>
<td>Mechanical Accounting</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Organization</td>
<td>3</td>
</tr>
<tr>
<td>Machine Design</td>
<td>3</td>
</tr>
<tr>
<td>Steam Power Equipment</td>
<td>3</td>
</tr>
<tr>
<td>Internal Comb. Engines</td>
<td>4</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Winter Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Organization</td>
<td>3</td>
</tr>
<tr>
<td>Machine Design</td>
<td>3</td>
</tr>
<tr>
<td>Steam Power Equipment</td>
<td>3</td>
</tr>
<tr>
<td>Internal Comb. Engines</td>
<td>4</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>4</td>
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</tbody>
</table>

#### Spring Quarter Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Contracts</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Behavior of Metals</td>
<td>4</td>
</tr>
<tr>
<td>Non-technical Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Notes:

1. May be taken only by students appointed to NROTC.

2. May be omitted by students appointed to advanced ROTC.

SENIOR ELECTIVES: Non-technical electives will be chosen from field other than engineering. Technical electives will be chosen from among the four groups listed below. All electives are subject to approval in advance by the head of the department.

- Group 1: M.E. 427, 429, 444, 445, 448, 542
- Group 2: I.E. 480; I.E. 404, 407, 441, 455.
- Group 3: T.A.M. 514, 517, 518, 544; M.E. 513, 515, 531, 532, 533
- Group 4: E.E. 439; Math 315, 451, 452, 453; Phys. 304, 421, 422, 423, 435
Division of Home Economics

HELEN R. LEBARON, Ph.D., Dean of Division of Home Economics
JULIA M. FALTENSON, M.S., Assistant Dean
Home Economics Hall, Room 122


PERSONNEL SERVICE. The Division, through its placement office, endeavors to find positions for all its graduates who are trained for professional work. The service is also extended to undergraduates needing employment through summer vacations and to alumnae who wish to make changes in positions. Home economics graduates are placed in a wide variety of positions, such as teachers in nursery schools, secondary schools and colleges; specialists in extension service; county extension home economists; dietitians; food service directors; home service directors for public utility companies; research workers; technicians in commercial laboratories; workers in retail clothing and home furnishing departments; members of editorial staffs of magazines and newspapers, and recreation workers in hospitals.

HONOR FRATERNITIES. There are two national home economics honor societies that have chapters at Iowa State College—Omicron Nu and Phi Upsilon Omicron. A chapter of Delta Phi Delta, a professional society in the field of applied art, selects its membership from the applied art majors. Among other honor or professional societies open to students of home economics are:

Iota Sigma Pi. ................. Chemistry ................. Women
Theta Sigma Phi ............... Journalism ................. Women
Sigma Alpha Iota ............. Music ....................... Women
Psi Chi ....................... Psychology ................. Men and Women
Sigma Delta Epsilon .......... Science ..................... Women
Sigma Xi ..................... All College .................. Men and Women
Mortar Board ................ All College .................. Women
Phi Kappa Phi ................ All College .................. Men and Women

HOME ECONOMICS CLUBS. All students of the division are eligible for membership in the various departmental clubs. These clubs include: Applied Art, Child Development, Food and Nutrition, General Home Economics, Home Economics Education, Household Equipment, Institution Management, Textiles and Clothing.

The Home Economics Council, which is made up of officers of the departmental clubs and other representatives, serves as the coordinating group and carries on certain activities, such as Home Economics Ball, United Nations Tea and Veishea Open House for the division.

Projects include a scholarship for a worthy student and sending delegates to state, province and American Home Economics Association meetings.

THE IOWA HOMEMAKER. A monthly magazine, The Iowa Homemaker, is published by the students of the division interested in preparing for editorial work in the field of home economics.

Scholarships

BORDEN HOME ECONOMICS SCHOLARSHIP. For a Senior. Value: $300. Qualifications: Must be a first-quarter senior in the Division of Home Economics (fall) and must have achieved the highest average grade of all other similarly eligible students in all preceding college work. To be eligible two or more courses in foods must be included in the curriculum. Established by the Borden Company, Inc. No applications are to be made.

DONELSON SCHOLARSHIP. For Undergraduates. Value: $100. Qualifications: Must be from small towns or rural communities from anywhere in the United States, enrolled in home economics or agriculture, in need of financial aid; should have shown in his or her freshman year average or above average ability. Established in 1954 in honor of V. Everett and Grace Miller Donelson, parents of Eva Donelson Wilson, a graduate of Iowa State College in home economics. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.


GENERAL FOODS 4-H CLUB SCHOLARSHIP. For 4-H Club Girls. Value: $100. Qualifications: Must be a resident of Iowa and have outstanding record in 4-H food and nutrition work. Established by the General Foods Company of New York. Apply to: 4-H Club Office, 312 Curtiss Hall.

GERBER LILLIAN STORMS COOVER SCHOLARSHIP. For a Sophomore, Junior or Senior. Value: $500. Qualifications: High scholarship and financial need. Major in food and/or nutrition. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.

HOME ECONOMICS CLUB SCHOLARSHIP. For Juniors. Value: Two or more for $66 each. Qualifications: Student must have worked approximately 15 hours a week for at least a year; outstanding in Home Economics Club work. Established by the Home Economics Club. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.

HOME ECONOMICS CLUB SCHOLARSHIP. For Freshmen. Value: $200. Qualifications: Must be in the upper one-fourth of their high school class, registered for the first time at Iowa State College; activity in high school organizations, community, school or church programs; financial need. Established by the Home Economics Club. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.

THE IOWA COUNTY EXTENSION HOME ECONOMISTS ASSOCIATION SCHOLARSHIP. For Freshmen. Value: $150. Qualifications: Must be a resident of Iowa; scholarship, financial need; interest and aptitude in the field of home economics as shown by active participation in Home Economics 4-H Club work. One who plans to attend, and expects to graduate, from Iowa State College and expects to enter a professional career in extension work. Established by the Iowa County Extension Home Economists Association. Apply to: 4-H Club Office, 312 Curtiss Hall.

CATHERINE MACKAY SCHOLARSHIP. For Freshmen. Value: One or more for $200 each. Qualifications: Must be in the upper one-fourth of their high school class, be registered for the first time at Iowa State College; activity in community, school or church programs; financial need. Established in 1921 by the Home Economics Club in memory of Catherine MacKay, first dean of the Division of Home Economics. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.

SEARS-ROEBUCK FOUNDATION SCHOLARSHIP. For Freshmen. Value: Three for $200 each. Qualifications: Must be in the upper one-fourth of their high school class, be registered for the first time at Iowa State College; must have participated in 4-H Club or Future Homemaker or similar activities; activity in community, school or church programs; financial need. Established by the Sears-Roebuck Company. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.

LILLIAN STORMS COOVER MEMORIAL SCHOLARSHIP. For Undergraduates. Value: $500. Qualifications: Major in nutrition or dietetics. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.
FLORENCE WALLS SCHOLARSHIPS. For Sophomores and Juniors. Value: $100 or $200. Qualifications: Financial need, ability, above average scholarship, personality. Established by Florence Walls, former food service supervisor at Iowa State College. Apply to: Home Economics Scholarships and Awards Committee, 122 Home Economics Hall.

Awards

Awards and prizes at Iowa State College may be in the form of scholarships, cash, medals, certificates, books or memberships in professional societies.

No application can be made for an award. Those who receive awards are selected from the student body by faculty members or others delegated to pick the winners on the qualifications under which the various honors are granted.

DANFORTH LEADERSHIP TRAINING AWARD. For a Freshman. Value: Two weeks of leadership training at the American Youth Foundation Camp, Shelby, Michigan. Qualifications: Most outstanding in balanced physical, mental, social and religious development. Established by the Ralston Purina Company.

DANFORTH SUMMER FELLOWSHIP AWARD. For a Senior. Value: Two weeks in St. Louis, Missouri, studying problems of manufacturing, commercial research, distribution, advertising and personnel, followed by two weeks of leadership training at the American Youth Foundation Camp, Shelby, Michigan, at the expense of the Ralston Purina Company. Qualifications: Most outstanding in balanced physical, mental, social and religious development. Established by the Ralston Purina Company.

DAR IMOGEN B. EMERY AWARD. For a Junior or a Senior. Value: Varies from $20 to $50. Qualifications: Better than average grades; leadership, personality; qualities of fine citizenship. Established by the State Chairman of Junior membership of the Iowa Daughters of the American Revolution.

VERA FOREMAN FRILEY AWARD. For a Senior. Value: $50. Qualifications: Outstanding in leadership in campus activities; dynamic personality; high scholarship. Established in memory of Vera Foreman Friley.

ESTHER COMPTON OGLAND MEMORIAL AWARD. For a Senior, Fall Quarter. Value: $25. Qualifications: Iowa girl in Home Economics Education, who has been prominent in divisional activities and who shows professional aptitude. Established in 1955 by A. B. Ogland of Grundy Center, Iowa, in memory of his wife, Esther Compton Ogland.

PHI UPSILONOMICRON AWARD. For a Freshman or a Sophomore. Value: $100. Qualifications: Scholarship, leadership, character, financial need. Established by the Omicron Chapter.

MARY F. RAUSCH AWARD. For a Junior or a Senior. Value: $15 to $20. Qualifications: Scholarship, initiative, character. Established in 1921 in memory of Mary F. Rausch by her sister, through funds left by Miss Rausch.

JULIA McCULLOCH SMITH AWARD. For a Senior. Value: $25. Qualifications: Must be in Food and Nutrition or Home Economics Education. Highest scholarship in at least seven consecutive quarters preceding January 1 of her senior year; outstanding in character and initiative. Established in 1931 by J. E. Smith of the Geology Department at Iowa State College in memory of his wife, Julia McCulloch Smith.


ANNA LARRABEE PRIZE. For a Senior. Value: Name inscribed on a silver tray. Qualifications: Outstanding in cookery. Established in 1925 when a tray was presented to the Division of Home Economics by Anna Larrabee of Clermont, through her interest in the enjoyment of the art of cookery.

DELTA PHI DELTA PRIZE. For a Junior. Value: A book. Qualifications: Must be a student in Applied Art who has contributed the most toward promotion of art during her three years on the campus.
Curricula in Home Economics

The various curricula in the Home Economics Division are planned on the assumption that a college education should provide for personal development, for preparation to carry the responsibilities of homemaking and citizenship and for a professional career.

The freshman year is designed to help orient students to college life and to begin their general education. Those who wish to make a selection of a specific curriculum upon entering may do so. Others are assigned to a program which is called Basic Home Economics until they have chosen a major. It is desirable that a selection of curriculum be made in the spring of the freshman year or at some time during the sophomore year so that certain sequences of courses that are required in the various curricula may be started as early as possible.

The curricula offered by the Division are applied art, child development, food and nutrition (with a major in dietetics, community nutrition or experimental foods), food and nutrition and related science, home economics for general education, home economics with a major in technical journalism, home economics education, home management, household equipment or household equipment and related science, institution management (with major in college food and housing administration, restaurant management, or school lunch service), textiles and clothing, or textiles and related science.

Students enrolled in any curriculum listed above may prepare for work in the Extension Service. Suggested electives should be considered in consultation with the Assistant Extension Director in charge of Home Economics. All students wishing to prepare for extension work should plan to take Psych. 334, V.Ed. 305, 466 and 467. Other recommended courses are listed on page 59. See page 254 for further information concerning the Extension Service.

Preparation for work as a home economist in the field of radio or television may be combined with several of the above curricula by taking additional courses. (See recommended courses in the applied art, child development, experimental foods, household equipment and textiles and clothing curricula, pages 83, 85, 91, 93). The student wishing to prepare for such work should consult her adviser and the Coordinator of Radio and Television Education. An additional period of study will usually be necessary.

The Core Curriculum

The general education of students in the Home Economics Division is provided by a group of required courses known as the core curriculum and by freedom to elect courses of a general nature. The core curriculum has three major objectives, namely, the (1) development of the student as a person, (2) preparation for family life, (3) preparation for the responsibilities of citizenship in its broadest sense.

The courses in the core curriculum are required of all students in the Home Economics Division, except those who choose related science combined with food and nutrition, household equipment or textiles, and men who choose a major within the Institutional Management Department.

HOME ECONOMICS .......................................................... 55 Credits

Applied Art ............................................................... 11 Credits

A.A. 103. Basic Design ............................................. 4 Credits
A.A. 261. Basic House Planning and Interior Design ........... 4 "
A.A. 384. Survey of Art ............................................. 3 "

Child Development ..................................................... 6 Credits

C.D. 146. Principles of Child Development ..................... 3 Credits
C.D. 270. Family Development: The Individual and His Family 3 Credits

Food and Nutrition .................................................... 14 Credits

F.&N. 107. Introduction to Nutrition ............................ 4 Credits
F.&N. 204. Food Preparation ....................................... 4 "
F.&N. 205. Food Preparation ....................................... 4 "
F.&N. 303. Meal Management ........................................ 3 "

Home Economics Orientation (105) .................................. 1 Credit

Home Management ...................................................... 10 Credits

H.Mgt. 174. Management for Daily Living ....................... 3 Credits
H.Mgt. 475. Home Management House ............................. 4 "
H.Mgt. 488. Family Finance ........................................ 3 "

Household Equipment .................................................. 3 Credits

H.Ed. 154. Fundamentals of Household Equipment .......... 3 Credits

Textiles and Clothing .................................................. 10 Credits

Textiles and Clothing .................................................. 10 Credits

Textiles and Clothing .................................................. 10 Credits

*F.&N. 208. Food Preparation, 5 cr. will replace F.&N. 204, 205, 8 cr. beginning Fall 1958.
**The Social Science option may be chosen from courses for which the student has the prerequisite background in economics, sociology, psychology, history, government or home management courses which are double listed with economics.**

Students who have decided upon their field of specialization by the final semester of the sophomore year may be substituted for Chem. 102A by students who are eligible to enroll in 102A.

### Freshman Year

Students should usually plan to complete 48 hours of credit during the freshman year. Courses from the sophomore year with 100 or 200 numbers, for which the student has prerequisite preparation, may be chosen in addition to those listed below.

**HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Skills</td>
<td>12</td>
</tr>
<tr>
<td>Eng. 101, 102, 103, Principles of Composition</td>
<td>9</td>
</tr>
<tr>
<td>Speech-Making</td>
<td>3</td>
</tr>
<tr>
<td>English Elective</td>
<td>3</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>24</td>
</tr>
<tr>
<td>Ec. 241, 242, Principles of Economics</td>
<td>6</td>
</tr>
<tr>
<td>Govt. 315, American Government</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 212, 213, European and American Civilization</td>
<td>6</td>
</tr>
<tr>
<td>Psych. 104, General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 134, Introduction to Sociology</td>
<td>3</td>
</tr>
</tbody>
</table>

**PHYSICAL AND BIOLOGICAL SCIENCES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 105, 106, General Chemistry</td>
<td>6</td>
</tr>
<tr>
<td>Chem. 264, Organic Chemistry</td>
<td>4-5</td>
</tr>
<tr>
<td>Phys. 106, Physics for Home Economics Students</td>
<td>4</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>8-10</td>
</tr>
<tr>
<td>Zool. 145, Elementary Physiology</td>
<td>5</td>
</tr>
</tbody>
</table>

**PHYSICAL EDUCATION**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Science</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>118-121</td>
</tr>
</tbody>
</table>

### Sophomore Year

Except for those students who have decided upon their field of specialization by the beginning of the sophomore year, a basic curriculum is outlined. Courses for the year are from the core curriculum and others, chosen by the student upon consultation with her adviser, to make a total of 49-50 credits.

Required courses with 100 numbers must be completed before the student enters the junior year. Courses with numbers in the one hundreds and two hundreds should usually be scheduled before those with higher numbers.

Suggested choices from the core curriculum recommended for the sophomore year are as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng. 101, 102, 103, Principles of Composition</td>
<td>9</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>6</td>
</tr>
<tr>
<td>Chem. 105, 106, General Chemistry</td>
<td>6</td>
</tr>
<tr>
<td>Phys. 106, Physics for Home Economics Students</td>
<td>4</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>5</td>
</tr>
</tbody>
</table>

**Physical Education**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 121, 122, 123, Physical Education</td>
<td>1</td>
</tr>
</tbody>
</table>

**Library**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library 106B (Fall)</td>
<td>R</td>
</tr>
</tbody>
</table>
HOME ECONOMICS ........................................ 15-21 Credits

Applied Art ........................................ 4 Credits

A.A. 261, Basic House Planning and Interior House Design

Child Development ........................................ 6 Credits

C.D. 226, Principles of Child Development

"C.D. 270, Family Development: The Individual and His Family"

Food and Nutrition .................................. 8 Credits

F.&N. 204, 205, Food Preparation ...................... 4 each

or

F.&N. 208, Foods I .................................. 5

F.&N. 209, Foods II .................................. 5

Household Equipment .................................. 5 Credits

H.&Eq. 154, Fundamentals of Household Equipment

Textiles and Clothing .................................. 6 Credits

T.&C. 204, General Textiles ........................... 1 Credits

T.&C. 224, Elementary Clothing Construction .........

HUMANITIES AND SOCIAL SCIENCES ................ 12-16 Credits

Communication Skills .................................. 3 Credits

Sp. 311, Speech-Making

Social Sciences ........................................ 15 Credits

E.C. 241, 242, Principles of Economics ............. 6

Hist. 212, 213, European and American Civilization.. 6

Option .................................................. 3

PHYSICAL AND BIOLOGICAL SCIENCES ............... 19-22 Credits

Biological Sciences ................................... 3-5 Credits

Bact. 200, General Bacteriology ..................... 3 Credits

or

**Bact. 304A or B. General Bacteriology .............. 5

Physical Sciences ..................................... 12-13 Credits

**Chem. 105, 106, General Chemistry ................ 6 Credits

***Chem. 264, Organic Chemistry .................... 4-5

Phys. 106, Physics for Home Economics Students ..... 4

PHYSICAL EDUCATION ................................ 1 Credit

"If not taken in freshman year.

"All students choosing majors in Food and Nutrition, Technical Journalism with foods sequence or
Institutional Management should schedule Bact. 304A or B. 5 credits.

"**If Chem. 105 and 106 are not scheduled in the freshman year they must be scheduled in the
sophomore year. Chem. 101, 102, 103 or Chem. 102A may be substituted.

"***All majors in the Food and Nutrition Department require the 5 credit course in Chem. 264.
also Chem. 265. Technical Journalism majors planning to take the food sequence should take Chem. 264
for 5 credits. Majors in experimental foods must take Chem. 334 and 335 instead of 264.

Students planning to select a major in the following should schedule in the sophomore
year certain courses not listed above:

Total Credits

Major in Applied Art, A.A. 231, 232, 233, 344, 345 .................. 10

Major in Household Equipment, Math. 200 .................. 5

Major in Technical Journalism and Home Economics

T.&J. 221, 222 ........................................... 8 Credits

Household Equipment sequence, Math. 200 .................. 5

Major in Related Science with emphasis on foods, household equipment or textiles,
see outlined courses on pages 87 and 88.

Major in Textiles and Clothing, A.A. 211, 212 .................. 4

Curriculum in Applied Art

Leading to the degree of Bachelor of Science.

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum,
see page 80.

Junior and Senior Years

The following courses are required in addition to those in the core curriculum.

HOME ECONOMICS ........................................ 44 Credits

Applied Art ........................................ 37 Credits

A.A. 231, 232, 233, Drawing and Composition ......... 6

A.A. 305, Advertising Design ........................ 2

A.A. 324, Life Drawing ................................ 2

A.A. 344, Craft Design ................................ 2

A.A. 345, Craft Design ................................ 2

A.A. 393, Sculptural Design ....................... ... 2

A.A. 401, Senior Study Tour ...................... ...... R

A.A. 404, Seminar ...................................... 1

A.A. 405, Advanced Advertising Design ............. 2

A.A. 424, Painting and Composition ................ 2

A.A. 434, Textile Design .............................. 3

A.A. 445, Advanced Craft Design .................... 2

A.A. 464, Intermediate Interior House Design ........ 3

A.A. 485, Medieval and Renaissance Art .............. 2

A.A. 486, Modern and Contemporary Art .............. 2

A.A. Option ............................................ 4
**HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.Ec. 400. Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>Textiles and Clothing</td>
<td>7</td>
</tr>
<tr>
<td>T.&amp;C. 324. Flat Pattern Designing</td>
<td>4</td>
</tr>
<tr>
<td>T.&amp;C. 414. Historic Textiles or T.&amp;C. 454. History of Costume</td>
<td>3</td>
</tr>
</tbody>
</table>

**OTHER REQUIRED COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engl. 205. Propaganda Analysis</td>
<td>7</td>
</tr>
<tr>
<td>or T.JL 225B. Publicity Methods</td>
<td>5</td>
</tr>
<tr>
<td>Mus. 144. Music Appreciation</td>
<td>1</td>
</tr>
<tr>
<td>Psychology Option</td>
<td>3</td>
</tr>
</tbody>
</table>

**ELECTIVES**                                                                 | 25 Credits |

Electives from the following are recommended: Sci. 405, T.JL 476. Only nine hours of the above courses, exclusive of A.A. 241, may be used as electives in the applied art curriculum.

Certification for teaching applied art in the secondary schools through science education will require more than twelve quarters of study. Nine hours of this requirement may be used as electives in the applied art curriculum. In order to meet these requirements, it is necessary to schedule in the sophomore year, V.Ed. 204. The following courses must be taken as a minimum:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.A. 300H</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 334</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 434</td>
<td>3</td>
</tr>
<tr>
<td>V.Ed. 204</td>
<td>3</td>
</tr>
<tr>
<td>V.Ed. 305</td>
<td>4</td>
</tr>
<tr>
<td>V.Ed. 426</td>
<td>5</td>
</tr>
<tr>
<td>Observation and Student Teaching</td>
<td>9</td>
</tr>
</tbody>
</table>

**Child Development**

Leading to the degree of Bachelor of Science.

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

**Junior and Senior Years**

The following courses are required in addition to those in the core curriculum:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Development</td>
<td>33 Credits</td>
</tr>
<tr>
<td>H.Ec. 400. Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>C.D. 366. Literature for Children</td>
<td>3</td>
</tr>
<tr>
<td>C.D. 336. Development in Early Childhood</td>
<td>3</td>
</tr>
<tr>
<td>C.D. 366. Play and Play Materials in the Nursery School</td>
<td>4</td>
</tr>
<tr>
<td>C.D. 368. Study Tour</td>
<td>R</td>
</tr>
<tr>
<td>C.D. 465. Seminar</td>
<td>2</td>
</tr>
<tr>
<td>C.D. 464. Methods of Nursery Education</td>
<td></td>
</tr>
<tr>
<td>C.D. 467. Supervised Teaching in the Nursery School</td>
<td>7</td>
</tr>
<tr>
<td>C.D. 468. Administration of Programs for Young Children</td>
<td>3</td>
</tr>
<tr>
<td>C.D. 480. Guidance in Later Childhood</td>
<td>3</td>
</tr>
<tr>
<td>F.N. 405. Nutrition of the Child in the Family</td>
<td>4</td>
</tr>
<tr>
<td>H.Ec. 400. Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>OTHER REQUIRED COURSES</td>
<td>24 Credits</td>
</tr>
<tr>
<td>Chem. 371. Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 234. Developmental Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Psych. options</td>
<td>6</td>
</tr>
<tr>
<td>C.D. or Soc. option</td>
<td>3</td>
</tr>
<tr>
<td>Soc. option</td>
<td>3</td>
</tr>
<tr>
<td>Zool. 358. Physiology of Reproduction</td>
<td>3</td>
</tr>
<tr>
<td>Zool. 426. Physical Growth of Children</td>
<td>3</td>
</tr>
</tbody>
</table>

**ELECTIVES**                                                                 | 19 Credits |

Students wishing to combine preparation for work in television with this curriculum should select 18 credits from Sci. 205, 206, 405; A.A. 241, 242; E.E. 315; Arch. 214, 217; H.Eq. 315; Music 144, 344; Sp. 301, 302, 307, 328; T.JL 475 or Engl. 315; T.JL 317, 325, 326, 476.
**Curriculum in Food and Nutrition**

Leading to the degree of Bachelor of Science.

**Major in Dietetics**

This major prepares the student for food service in hospitals, clinics and sanatoria, and for private consultation in cooperation with doctors. It meets the academic requirements of the American Dietetic Association.

**Junior and Senior Years**

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

The following courses are required in addition to those in the core curriculum.

**HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Nutrition</td>
<td>22</td>
</tr>
<tr>
<td>*F.&amp;N. 209. Foods II</td>
<td></td>
</tr>
<tr>
<td>F.&amp;N. 305. Nutrition and Dietetics</td>
<td>3</td>
</tr>
<tr>
<td>F.&amp;N. 404. Seminar in Nutrition and Dietetics</td>
<td>2</td>
</tr>
<tr>
<td>F.&amp;N. 409. Diet Therapy</td>
<td>3</td>
</tr>
<tr>
<td>F.&amp;N. 410. Nutrition During Human Growth and Development</td>
<td>3</td>
</tr>
<tr>
<td>F.&amp;N. 418. Methods of Teaching Hospital Dietetics</td>
<td>3</td>
</tr>
<tr>
<td>H.Ed. 412. Principles of Education for Dietitians</td>
<td>2</td>
</tr>
<tr>
<td>Institution Management</td>
<td>11</td>
</tr>
<tr>
<td>I.Mgt. 380. Large Quantity Cookery</td>
<td>4</td>
</tr>
<tr>
<td>I.Mgt. 484. Purchasing</td>
<td>4</td>
</tr>
<tr>
<td>I.Mgt. 487. Organization and Management</td>
<td>3</td>
</tr>
</tbody>
</table>

**OTHER REQUIRED COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>10</td>
</tr>
<tr>
<td>Chem. 265. Food Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 335. Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 371. Biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>I.A. 372B. General Accounting</td>
<td>4</td>
</tr>
<tr>
<td>Psych. Elect.</td>
<td>3</td>
</tr>
<tr>
<td>T.J. 215B. Publicity Methods</td>
<td>3</td>
</tr>
<tr>
<td>or Electives in English or Speech</td>
<td></td>
</tr>
<tr>
<td>Zool. 335. Physiology of Reproduction</td>
<td>3</td>
</tr>
</tbody>
</table>

**ELECTIVES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

**Major in Experimental Foods**

This major serves those who are interested in product development and food promotion programs in industries, experimental food kitchens, food columns in papers and magazines, food programs on radio and television. It leads to careers in business or in food research.

**Junior and Senior Years**

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

The following courses are required in addition to those in the core curriculum:

**HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Nutrition</td>
<td>21</td>
</tr>
<tr>
<td>*F.&amp;N. 209. Foods II</td>
<td></td>
</tr>
<tr>
<td>F.&amp;N. 305. Nutrition and Dietetics</td>
<td>3</td>
</tr>
<tr>
<td>F.&amp;N. 404. Seminar in Nutrition and Dietetics</td>
<td>2</td>
</tr>
<tr>
<td>F.&amp;N. 409. Diet Therapy</td>
<td>3</td>
</tr>
<tr>
<td>F.&amp;N. 511, 512, 513. Experimental Foods</td>
<td>9</td>
</tr>
<tr>
<td>H.Ed. 400. Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>I.Mgt. 380. Large Quantity Cookery</td>
<td>4</td>
</tr>
</tbody>
</table>

**OTHER REQUIRED COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>14</td>
</tr>
<tr>
<td>Chem. 265. Food Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 335. Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 371. Biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>Psych. Elect.</td>
<td>3</td>
</tr>
<tr>
<td>Tech. 302. Radio and Television Speech</td>
<td>3</td>
</tr>
<tr>
<td>T.J. 215B. Publicity Methods</td>
<td>3</td>
</tr>
<tr>
<td>T.J. 335. Feature Articles for Technical Journals</td>
<td>3</td>
</tr>
<tr>
<td>Zool. 335. Physiology of Reproduction</td>
<td>3</td>
</tr>
</tbody>
</table>

*Effective after fall, 1958.*
ELECTIVES

Students wishing to combine preparation for work in television with the experimental cookery major should take as a minimum the following:

- 2 quarters of TV Workshop
- A.A. 341
- E.E. 325
- Sp. 301
- T.J.L. 475 or Engl. 315

Total 18 Credits

**Options—Select 6 credits from the following:

- A.H. 274
- Bot. 401, 535
- H.Eq. 315
- I.Mgt. 580, 585
- T.J.L. 317, 325, 475, 590B

***Sp. 302 is now required in the experimental cookery major. In addition to the courses listed as minimum preparation students may substitute for 6 credits of options listed for the experimental cookery major 6 credits from the following courses recommended for preparation in television: H.Eq. 315; Music 144, 344; Sci. 405; T.J.L. 325, 326.

Major in Community Nutrition

This major is planned for students interested in helping people everywhere to use the knowledge in nutrition for the betterment of their health. This training leads to opportunities in many areas including: teaching in public schools or in extension; working as a nutritionist with social welfare agencies or with public health departments, or with industries. The major also provides good background for further specialized training or for an advanced degree in nutrition. Electives should be selected with the major area of interest in mind. Groups of electives appropriate for various types of work are described below.

Junior and Senior Years

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

HOME ECONOMICS ........................................................................................................ 19 or 22 Credits
Food and Nutrition ......................................................... 22 Credits
  *F.&N. 209. Foods II ....................................................... 3 Credits
  F.&N. 305. Nutrition and Dietetics .................................. 4
  F.&N. 404. Seminar in Nutrition and Dietetics ................ 2
  F.&N. 409. Diet Therapy .................................................. 3
  F.&N. 410. Nutrition During Human Growth and Development 3
  F.&N. 411. Selected Studies in Experimental Foods ......... 4
  F.&N. 514. Community Nutrition .................................... 3
  H.Eq. 400. Professional Relations ................................ R

*Effective after Fall, 1958.

OTHER REQUIRED COURSES ......................................................................................... 28 Credits
  Chemistry ................................................................. 10 Credits
    Chem. 265. Food Analysis ......................................... 5 Credits
    Chem. 371. Biochemistry .......................................... 3
    Chem. 370. Laboratory in Biochemistry .................... 2
  Psych. Elective ......................................................... 3 Credits
  Sociology ........................................................................ 9
    Soc. 300. Sociological Principles ............................. 3
    Soc. 364. Group Work Techniques ............................ 3
    Soc. 464. Community Action ................................... 3
    Soc. 485. Sociology of the Family ............................. 3
    T.J.L. 225B. Publicity Methods ............................... 3
    Zo. 353. Physiology of Reproduction ........... 3

ELECTIVES .................................................................................................................. 27 Credits

Because of the large number of electives in this curriculum, there are many opportunities for combining other fields of subject matter with this major. These should be carefully planned with the adviser.

1For extension, social welfare, or public health agencies, select 9 Credits.

Sociology ........................................................................ 9 Credits
  Soc. 409. Introduction to Social Anthropology .......... 3
  Soc. 450. Fields of Social Work ................................ 3
  Soc. 488. Family Legislation ..................................... 3
  Soc. 490. Social Case Work ....................................... 3

1For extension, social welfare, or public health agencies, select 9 Credits.
For teaching Home Economics in high school:
C.D. 480. Guidance in Later Childhood ........................ 18
Home Economics Education .................................. 18
H.Ed. 405. Observation of Teaching .......................... 2
H.Ed. 407. Supervised Teaching in Home Economics ...... 8
H.Ed. 408. Methods in Adult Homemaking Education ...... 3
H.Ed. 409. Planning and Evaluating the H.Ec. Program .... 3
Psychology ................................................... 6
Psych. 234. Developmental Psychology ........................ 3
Psych. 334. Educational Psychology .......................... 3
T.Ed. 324. Advanced Clothing ................................ 4
Vocational Education .................................. 10
V.Ed. 204. Principles of Education .......................... 3
V.Ed. 205. Methods of Teaching .............................. 4
V.Ed. 426. Principles of Secondary Education ............. 5

For working in food industries the student may wish to choose electives in the area of communications, such as journalism, speech, television.

Curriculum in Home Economics For General Education
(Non-Professional)

Leading to the degree of Bachelor of Science.
For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.
This curriculum is designed for the student interested in home economics and in a broad cultural education, as well as additional training for homemaking. It offers general education in all areas of home economics, and permits options in the social sciences, physical and biological sciences, English, modern languages or mathematics depending upon the particular interests of the student. As soon as possible after choosing this curriculum the student should plan with the adviser for the selection of a series of courses that will insure a well-balanced program.

Junior and Senior Years

The following courses are required in addition to those in the core curriculum.

HOME ECONOMICS .................................. 15 Credits

*Choose courses beyond core curriculum from two or more areas of home economics.

OTHER REQUIRED COURSES ............................. 36 Credits

*Social Science Options—Economics, Sociology, Psychology, Philosophy, History .......................... 15 Credits
**Physical and Biological Science Options .......................... 6 Credits
***English, Modern Language, or Mathematics .......................... 15 Credits

ELECTIVES ........................................ 25 Credits

*Choose courses from at least two areas.
**15 credits in one or in combination with one or more.

Curriculum in Home Economics and Related Science

Leading to the degree of Bachelor of Science.
This curriculum is planned for students who wish to emphasize science in relation to food and nutrition, household equipment, or textiles. Students who have completed one of these majors have found interesting opportunities in research laboratories in colleges and universities, medical laboratories, foundations, and in industry. These majors also provide an excellent background for graduate study basic to professional advancement in the specified fields. It should be noted that the freshman year, common to these three majors, is also similar to the freshman year of all other curricula in Home Economics.

Students are advised to consult the head of the department in which they wish to place major emphasis before planning their program of study.

Freshman Year

TOTAL CREDITS ................................ 42, 43, or 44

A.A. 103, Basic Design ................................. 4 Credits
Chemistry ................................................. 12

Chem. 101, 102, General Chemistry
or
Chem. 102A or 103A, General Chemistry .......................... 8 Credits

Chem. 105, 106, General Chemistry
or
Chem. 103, General Chemistry and Qualitative Analysis .......................... 4 "

Engl. 101, 102, 103. Principles of Composition .......................... 9 "
F.&N. 107*, Introduction to Food and Nutrition
or
Soc. 134, Introduction to Sociology .......................... 3 "

*To be taken by those who expect to major in Textiles and Related Science.
**Major in Home Economics**

**Major in Textiles and Related Science**

Administered by the Textiles and Related Science Department.

For freshman year, see page 86.

**Major in Food and Nutrition and Related Science**

Administered by the Food and Nutrition Department.

For freshman year, see page 86.

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**Sophomore, Junior, and Senior Years**

<table>
<thead>
<tr>
<th>COURSES</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.A. 384, Survey of Art.</td>
<td>3 Credits</td>
</tr>
<tr>
<td>C.D. 256, Principles of Child Development</td>
<td>3</td>
</tr>
<tr>
<td>Food and Nutrition</td>
<td>23</td>
</tr>
<tr>
<td>F.N.E. 204, 205, Food Preparation</td>
<td>8 Credits</td>
</tr>
<tr>
<td>or 206 and 209*</td>
<td></td>
</tr>
<tr>
<td>F.A.N. 503, Family Meal Management</td>
<td>3</td>
</tr>
<tr>
<td>F.A.N. 505, Nutrition and Dietetics</td>
<td>4</td>
</tr>
<tr>
<td>F.A.N. 494, Seminar in Nutrition and Dietetics</td>
<td>2</td>
</tr>
<tr>
<td>or F.A.N. 511, 512, Experimental Foods</td>
<td>6 Credits</td>
</tr>
<tr>
<td>or F.A.N. 411, Experimental Foods</td>
<td>4</td>
</tr>
<tr>
<td>or F.A.N. 415, Introduction to Nutrition Res.</td>
<td>3</td>
</tr>
<tr>
<td>or F.A.E. 400, Professional Relations</td>
<td>R</td>
</tr>
</tbody>
</table>

**Other Required Courses**

- **Bact. 304A or B, General Bacteriology I** | 5 Credits |
- **Chem. 211 or 214, Quantitative Analysis** | 3 Credits |
- **Chem. 230, 234, 235, 236** | 13 |
- **Chem. 334, 335, 336** | 12 |
- **Chem. 374, 375** | 6 |
- **Ec. 241, 242, Principles of Economics** | 6 |
- **English Literature** | 3 |
- **T.J. 225B, Publicity Methods** | 3 |
- **Govt. 315, American Government** | 3 |
- **Hist. 212, 213, European and American Civilization since 1350** | 6 |
- **Mathematics** | 23 |
- **Math. 101, College Algebra** | 5 Credits |
- **Math. 101A, Plane Trigonometry** | 5 |
- **Math 103, Analytical Geometry** | 5 |
- **Math. 211, 212, Calculus** | 8 |
- **M.L. 231A, 232A, 233A, Reading Knowledge of German** | 9 Credits |
- **or M.L. 231, 232, 233, Elementary German** | |
- **or M.L. 201, 202, 203, Elementary French** | |
- **or M.L. 201A, 202A, Reading Knowledge of French** | |
- **Phys. 211, 212, 213, General Physics** | 12 |
- **Sp. 311, Speech-Making** | 3 |
- **Science Options** | 6 |
- **C.D. 256, Principles of Child Development** | 3 |
- **Social Science Option** | 3 |
- **Physical Education** | 1 |

**Electives** | 17-22 Credits

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*Effective after Fall, 1958.

**Recommended Chem. 483-484; Bact. 501, 535; or other course groups approved by adviser.

**Students entering with less than 1.5 years of high school algebra should take Math. 5 before Math. 101.
The following courses in addition to those in the freshman year are required.

**Sophomore, Junior, and Senior Years**

### HOME ECONOMICS
- A.A. 384, Survey of Art ........................................... 3 Credits
- C.D. 236, Principles of Child Development ................... 3 **
- Food and Nutrition .................................................. 14 **
- F.N. 204, 205, Food Preparation ................................. 8 Credits
- or F.N. 208, 209, Foods I and II ................................ 8 **
- H.Ec. 200, Professional Relations ............................... R **
- H.Mgt. 474, General Home Management .......................... 3 **
- Home Management Elective ....................................... 3 **
- Household Equipment ................................................ 20 **
- H.Ec. 134, Fundamentals of Household Equipment ............. 3 Credits
- H.Ec. 404, 405, 406, Equipment Mechanics ..................... 6 **
- H.Eq. 425, Seminar .................................................. 1 **
- H.Eq. 407, Gas and Electric Cooking Appliances .............. 3 **
- H.Eq. 409, Refrigeration and Home Lighting .................... 3 **

**OTHER REQUIRED COURSES**
- Bact. 304A or B, General Bacteriology I ....................... 5 Credits
- or Chemistry ................................................................ 13 **
- Chem. 264, Organic Chemistry ....................................... 5 Credits
- Chem. 371, Biochemistry ............................................ 3 **
- Ec. 241, 242, Principles of Economics ............................ 6 **
- Eng. 414, Writing of Scientific Papers ........................... 3 **
- Govt. 215, American Government .................................. 3 **
- Hist. 212, 213, European and American Civilization since 1350 6 **
- Mathematics ................................................................ 23 **
- Math 101A, College Algebra ...................................... 5 Credits
- Math 102A, Plane Trigonometry .................................... 5 **
- Math 103, Analytical Geometry .................................... 4 **
- Math 211, Calculus .................................................... 4 **
- Modern Language (French or German). ........................ 9 **
- or Stat. 201, Principles of Statistics ............................. 5 **
- or Physics ................................................................ 12 **
- Phys. 211, 212, 213, General Physics ............................ 3 **
- Social Science Option ................................................. 3 **
- or Sp. 311, Speech-Making ........................................... 3 **
- T.Jl. 225B, Publicity Methods ...................................... 3 **
- or Physical Education .................................................... 1 **

**ELECTIVES** ................................................................. 11-15 Credits

Major in Textiles and Related Science

Administered by the Textiles and Clothing Department.

For freshman year, see page 86.

The following courses in addition to those in the freshman year are required.

**Sophomore, Junior, and Senior Years**

### HOME ECONOMICS
- A.A. 384, Survey of Art ............................................. 3 Credits
- C.D. 236, Principles of Child Development ..................... 3 **
- F.N. 204, 205, Food Preparation .................................... 8 Credits
- or F.N. 208, 209, Foods I and II .................................. 8 **
- H.Ec. 200, Professional Relations .................................. R **
- Textiles and Clothing .................................................. 15 **
- T.&C. 204, Textiles ..................................................... 3 Credits
- T.&C. 224, Elementary Clothing Construction ................. 3 **
- T.&C. 404, Advanced Textiles ....................................... 3 **
- T.&C. 414, Historic Textiles ........................................ 3 **
- T.&C. 454, History of Costume ...................................... 3 **

**OTHER REQUIRED COURSES**
- Bact. 304A or B, General Bacteriology I ...................... 5 Credits
- or Chemistry ................................................................ 25 or 28 **
- Chem. 211 or 214, Quantitative Analysis ....................... 3 Credits
- Chem. 268, Textile Chemistry ...................................... 5 **
- Chem. 234, 235, Organic Chemistry ............................... 6 **
- Chem. 466, Textile Chemistry ....................................... 4 **
- Chem. 320, 321, 322, Physical Chemistry ...................... 8 **
- or Stat. 201, Principles of Statistics ............................. 5 **
- or Ec. 241, 242, Principles of Economics ....................... 6 **
- Govt. 215, American Government .................................. 3 **
- Hist. 212, 213, European and American Civilization since 1350 6 **
- Mathematics ................................................................ 23 **

*Effective Fall 1958.

**Students entering with less than 1½ years of high school algebra should take Math. 5 before Math. 101.
**Electives**

**Home Economics**

work in media associated with home economics. See page.

**Technical Journalism**

in productions for the College stations, home economics.

**Curriculum in Home Economics With Major in Technical Journalism**

Administered by the Dean of the Division of Home Economics.

Leading to the degree of Bachelor of Science.

A variety of positions is open to women with combined training in home economics and technical journalism. Such positions include editorial, advertising, radio and television work in media associated with home economics.

Students in home economics with a major in technical journalism have opportunities for practical experience through work on campus publications including *The Iowa Homemaker*, published by home economics students. Many young women also lay foundations for active careers by contributing to magazines and newspapers and by participating in productions for the College stations, WOI-AM, FM and TV.

**Junior and Senior Years**

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

The following courses are required in addition to those in the core curriculum.

**Electives**

Students entering with less than 1½ years of high school algebra should take Math. 5 before Math. 101.

**Curriculum in Home Economics Education**

Leading to the degree of Bachelor of Science.

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

The following courses are required in addition to those in the core curriculum.

**Electives**

*These courses should be taken in the sophomore year.

**Electives**

*Effective Fall, 1958.

*See top of page 90.
OTHER REQUIRED COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 371, Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>English, Speech or Technical Journalism Option</td>
<td>3</td>
</tr>
<tr>
<td>Psychology</td>
<td>6</td>
</tr>
<tr>
<td>Psych. 234, Developmental Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 334, Educational Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 419, Families and the Professional Person</td>
<td>3</td>
</tr>
</tbody>
</table>

15 Credits

ELECTIVES

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.&amp;N. 209, Food Preparation</td>
<td>3</td>
</tr>
<tr>
<td>F.&amp;N. 305, Nutrition and Dietetics</td>
<td>4</td>
</tr>
<tr>
<td>F.&amp;N. 411, Selected Studies in Experimental Foods</td>
<td>4</td>
</tr>
<tr>
<td>F.&amp;N. 511, Experimental Foods</td>
<td>3</td>
</tr>
<tr>
<td>H.Ec. 400, Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>Household Equipment</td>
<td>20</td>
</tr>
<tr>
<td>H.Eq. 400, Senior Observation Trip</td>
<td>R</td>
</tr>
<tr>
<td>H.Eq. 404, 405, 406, Equipment Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>H.Eq. 407, Gas and Electric Cooking Appliances</td>
<td>3</td>
</tr>
<tr>
<td>H.Eq. 408, Kitchen Planning and Laundering Equipment</td>
<td>3</td>
</tr>
<tr>
<td>H.Eq. 409, Refrigeration and Home Lighting</td>
<td>3</td>
</tr>
<tr>
<td>H.Eq. 413, Seminar</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>25 or 26 Credits</td>
</tr>
</tbody>
</table>

24 Credits

Curriculum in Home Management

Leading to the degree of Bachelor of Science.

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

Junior and Senior Years

The following courses are required in addition to those in the core curriculum.

HOME ECONOMICS

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Development Option</td>
<td>3</td>
</tr>
<tr>
<td>*F.&amp;N. 209, Foods II</td>
<td>3</td>
</tr>
<tr>
<td>H.Ec. 400, Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>Home Management</td>
<td>15</td>
</tr>
<tr>
<td>H.Mgt. 414, Economic Functions of the Family</td>
<td>3 Credits</td>
</tr>
<tr>
<td>H.Mgt. 415, Consumers in the Market</td>
<td>3</td>
</tr>
<tr>
<td>H.Mgt. Option</td>
<td>9</td>
</tr>
<tr>
<td>H.Eq. 445, Advanced General Equipment</td>
<td>3</td>
</tr>
</tbody>
</table>

24 Credits

OTHER REQUIRED COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 371, Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>Ec. 409, National Income and Employment</td>
<td>3</td>
</tr>
<tr>
<td>Engl. Option (Literature)</td>
<td>6</td>
</tr>
<tr>
<td>Psych. Option</td>
<td>6</td>
</tr>
<tr>
<td>Sociology</td>
<td>6</td>
</tr>
<tr>
<td>Soc. 305, Social Interaction</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 409, Introduction to Social Anthropology</td>
<td>3 Credits</td>
</tr>
<tr>
<td>Social Science Option</td>
<td>3</td>
</tr>
</tbody>
</table>

78 Credits

Curriculum in Household Equipment

Leading to the degree of Bachelor of Science.

Junior and Senior Years

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

The following courses are required in addition to those in the core curriculum.

HOME ECONOMICS

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Nutrition</td>
<td>20-31</td>
</tr>
<tr>
<td>*F.&amp;N. 209, Food Preparation</td>
<td>3 Credits</td>
</tr>
<tr>
<td>F.&amp;N. 305, Nutrition and Dietetics</td>
<td>4</td>
</tr>
<tr>
<td>F.&amp;N. 411, Selected Studies in Experimental Foods</td>
<td>4</td>
</tr>
<tr>
<td>or F.&amp;N. 511, Experimental Foods</td>
<td>3</td>
</tr>
<tr>
<td>H.Ec. 400, Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>Household Equipment</td>
<td>20</td>
</tr>
<tr>
<td>H.Eq. 400, Senior Observation Trip</td>
<td>R</td>
</tr>
<tr>
<td>H.Eq. 404, 405, 406, Equipment Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>H.Eq. 407, Gas and Electric Cooking Appliances</td>
<td>3</td>
</tr>
<tr>
<td>H.Eq. 408, Kitchen Planning and Laundering Equipment</td>
<td>3</td>
</tr>
<tr>
<td>H.Eq. 409, Refrigeration and Home Lighting</td>
<td>3</td>
</tr>
<tr>
<td>H.Eq. 413, Seminar</td>
<td>2</td>
</tr>
</tbody>
</table>

20-26 Credits

OTHER REQUIRED COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 371, Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 414, Writing of Scientific Papers</td>
<td>3</td>
</tr>
<tr>
<td>Math. 203, General Mathematics for Students of Home Economics</td>
<td>5</td>
</tr>
<tr>
<td>Psych. Option, 284, 285, or 354</td>
<td>3</td>
</tr>
<tr>
<td>T.H. 22B, Publicity Methods</td>
<td>3</td>
</tr>
<tr>
<td>Eight or nine credits from the following 1 Mgt. 380, H.Eq. 421, H.Eq. 422, Sp. 302.<strong>Phys. 211, 212.</strong></td>
<td></td>
</tr>
</tbody>
</table>

19-21 Credits

Students wishing to combine preparation for work in television with this curriculum will usually need to plan for more than twelve quarters of study. They should consult with their advisers and the Coordinator of Radio and Television Education in the selection.

*Effective Fall, 1958.
**Students who take Phys. 211, 212 should take Math. 101, and 102 or 112 in place of Math 200.
**HOME ECONOMICS**

**Curriculum in Institutional Management**

Leading to the degree of Bachelor of Science.

For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

For men selecting a major in this department, the following adjustments will be made: add—Mil. Sci. I and II (6 credits). Phys. Ed. six quarters (R). Recommended electives (20); Social Science Option (3); Zool. 351 (3). For women, see page 91. This curriculum meets the academic requirements for membership in the American Dietetic Association and qualifies the student for an internship approved by the Association.

**Major in College Food and Housing Administration**

**Junior and Senior Years**

The following courses are required in addition to those listed for men and women in the core curriculum.

**HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Nutrition</td>
<td>11</td>
</tr>
<tr>
<td>Fi.N. 209: Food Preparation</td>
<td>3</td>
</tr>
<tr>
<td>Fi.N. 305: Nutrition and Dietetics</td>
<td>4</td>
</tr>
<tr>
<td>Fi.N. 411: Selected Studies in Experimental Foods</td>
<td>4</td>
</tr>
<tr>
<td>H.Ec. 400: Professional Relations</td>
<td>R</td>
</tr>
<tr>
<td>Institution Management</td>
<td>32</td>
</tr>
<tr>
<td>21.Mgt. 380: Large Quantity Cookery</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 400: Study Tour</td>
<td>R</td>
</tr>
<tr>
<td>1.Mgt. 404: Seminar</td>
<td>2</td>
</tr>
<tr>
<td>1.Mgt. 484: Purchasing</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 485: Equipment</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 486: Institution Management Experience</td>
<td>8</td>
</tr>
<tr>
<td>1.Mgt. 487: Organization and Management</td>
<td>3</td>
</tr>
<tr>
<td>2.I.Mgt. 485: Catering</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 589: House Administration</td>
<td>3</td>
</tr>
<tr>
<td>OTHER REQUIRED COURSES</td>
<td>21-24</td>
</tr>
<tr>
<td>Chem. 265: Food Analysis</td>
<td>5</td>
</tr>
<tr>
<td>Chem. 371: Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>I.Ad. 372: General Accounting</td>
<td>4</td>
</tr>
<tr>
<td>I.E. 455: Motion and Time Study</td>
<td>3</td>
</tr>
<tr>
<td>I.E. 351: Industrial Organization</td>
<td>3</td>
</tr>
<tr>
<td>or I.E. 425: Personnel Supervision</td>
<td>3</td>
</tr>
<tr>
<td>or I.E. 437: Job Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>Psychology Option</td>
<td>3</td>
</tr>
</tbody>
</table>

**Electives**

7-10 Credits

**Major in Restaurant Management**

**Junior and Senior Years**

The following courses are required in addition to those listed for men and women in the core curriculum.

**HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Nutrition</td>
<td>11 or 13</td>
</tr>
<tr>
<td>Fi.N. 209: Food Preparation</td>
<td>3</td>
</tr>
<tr>
<td>Fi.N. 305: Nutrition and Dietetics</td>
<td>4</td>
</tr>
<tr>
<td>Fi.N. 411: Selected Studies in Experimental Foods</td>
<td>4</td>
</tr>
<tr>
<td>or Fi.N. 511: 512 Experimental Foods</td>
<td>R</td>
</tr>
<tr>
<td>Home Ec. 400 Professional Relations</td>
<td>32</td>
</tr>
<tr>
<td>1.Mgt. 380: Large Quantity Cookery</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 400: Study Tour</td>
<td>R</td>
</tr>
<tr>
<td>1.Mgt. 404: Seminar</td>
<td>2</td>
</tr>
<tr>
<td>1.Mgt. 484: Purchasing</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 485: Equipment</td>
<td>4</td>
</tr>
<tr>
<td>1.Mgt. 486: Institution Management Experience</td>
<td>8</td>
</tr>
<tr>
<td>1.Mgt. 487: Organization and Management</td>
<td>3</td>
</tr>
<tr>
<td>1.Mgt. 580: Experimental Quantity Cookery</td>
<td>3</td>
</tr>
<tr>
<td>2.I.Mgt. 582: Catering</td>
<td>4</td>
</tr>
</tbody>
</table>

*Effective Fall 1958.
*Advanced reservation required.
*See page 92.
Major in School Food Service

Junior and Senior Years

The following courses are required in addition to those listed for men and women in the core curriculum.

**HOME ECONOMICS**

24 Credits

Food and Nutrition ............................................. 14 Credits

Chem. 265 Food Analysis ...................................... 5 Credits
Chem. 371 Biochemistry ........................................ 3 "
I.Ad. 372B General Accounting ............................... 3 "

**ELECTIVES** ............................................. 14-16 Credits

**OTHER REQUIRED COURSES**

CHEM 265 Food Analysis ...................................... 5 Credits
CHEM 371 Biochemistry ........................................ 3 "
I.AD. 372B General Accounting ............................... 3 "

3 Effective Fall, 1958.
2 Advance Reservation required.
8 Recommended electives.

For College Food and Housing Administration majors—Arch 336, Ec. 304, 445, 446, I.Mgt. 580.

Curriculum in Textiles and Clothing

Leading to the degree of Bachelor of Science.
For freshman year, see page 81; for sophomore year, see page 81; for core curriculum, see page 80.

**Junior and Senior Years**

The following courses are required in addition to those in the core curriculum.

**HOME ECONOMICS**

60 Credits

Applied Art ..................................................... 7 Credits

"A.A. 211, 212, Fashion Illustration ......................... 4 Credits
"A.A. 434, Textile Design ........................................ 3 "
H.Ec. 400, Professional Relations ............................ R

"Textiles and Clothing ........................................ 4 Credits

"T.&C. 324, Flat Pattern Designing ............................ 3 "
"T.&C. 404, Advanced Textiles .................................... 3 "
"T.&C. 414, Historic Textiles ................................. 3 "
"T.&C. 424, Designing by Draping .............................. 3 "
"T.&C. 444, Advanced Costume Selection ........................ 3 "
"T.&C. 454, History of Costume ................................. 3 "
"T.&C. 464, Textile and Clothing Purchasing ................. 2 "
"T.&C. 465, Professional Opportunities in Textiles and Clothing .......................... 2 "

**OTHER REQUIRED COURSES**

20 Credits

English ........................................................... 6 Credits

Eng. 304, Advanced Composition ............................ 3 "
Eng. 304, Advanced Composition or T.JL 225B, Publicity Methods 3 "
Psychology Option ............................................. 3 "

**ELECTIVES** ............................................. 37 Credits

Students wishing to combine preparation for work in television with this curriculum should take the following courses as a minimum:

*These courses should be taken in the sophomore year as a rule.
The following substitutions for required courses will be permitted when preparation for TV is combined with the textiles and clothing curriculum.

- Sp. 302 for Engl. 254.
- T.J.I. 475 or Engl. 315 for Engl. 304 or T.J.I. 225B.

Electives from the following are also advised: H.Eq. 315, Sci. 405.

**Division of Science**

**RICHARD S. BEAR, Dean, Division of Science, Ph.D.**

**Beardshear Hall, Room 111**

The Division of Science includes the following departments of instruction: Air Science, Bacteriology, Botany, Chemistry, Economics and Sociology, English and Speech, Geology, History, Government and Philosophy, Hygiene, Industrial Administration, Library, Mathematics, Military Science, Modern Languages, Music, Naval Science, Physical Education for Men, Physics, Psychology, Statistics, Zoology and Entomology. The faculty of the division is made up of the following:

1. Members of all departments within the division.
2. Members of all departments within the Industrial Science Research Institute.

**PERSONNEL SERVICE.** Through its Personnel Office the Division of Science keeps in close contact with those industries, commercial organizations, and other fields of activity that require the services of young men and women trained in the sciences, and assists students in securing positions. This service is available to the members of each graduating class, and to graduates of earlier years who desire to enter new lines of work. The Teacher Placement Service maintained by the college is also available.

**OPPORTUNITIES FOR GRADUATES IN SCIENCE.** The remarkable development of the sciences in the last half-century, and the extensive applications of these sciences to present day industry and commerce, and to the economic and social aspects of modern life, have resulted in an increasing demand for scientists and technicians in industry, and for teachers and investigators of science.

**HONORS AND HONOR SOCIETIES.** Scholarship holds a high place in Iowa State College, and appropriate honors are bestowed upon students whose academic records are outstanding. In addition to prizes and letters, there are many honor organizations for admission to which high scholarship is a prerequisite. These campus societies are listed in The Chart.

**THE SCIENCE COUNCIL** is the governing body of the student organizations and activities in the Division of Science. The members of the Council collect and summarize student opinion concerning educational objectives and methods; the Council sponsors activities designed to promote closer acquaintance among faculty members and students and to develop a spirit of loyalty to the Division.

**THE SCIENCE WOMEN'S CLUB** provides opportunity, through its monthly meetings, for the consideration of matters of common intellectual interest, and sponsors the social activities of the women students in the Division of Science.

**THE IOWA STATE SCIENTIST,** under the supervision of a Publications Board composed of both students and faculty representatives, brings to its readers news about the Science Division—its educational plans and purposes, its research program, and its faculty and students.
Science Awards

**Alpha Chi Sigma Awards.** For Sophomores and Seniors. Value: For Sophomores: Chemistry handbooks to two male students. For Seniors: Fee for a Junior membership in the American Chemical Society. Qualifications: For Sophomores: Highest scholastic records in Chemical Engineering or Chemical Technology. For Seniors: Highest ranking male graduating student in Chemical Engineering, Chemical Technology or in Science, major in Chemistry.

**Chi Omega Award.** To a Senior Woman. Value: $25. Qualifications: Most outstanding woman of the senior class majoring in any of the social sciences.

**Dio Lewis Holl Award.** For a Senior. Value: $50. Qualifications: Outstanding senior student who completes his work in the current academic year in the curriculum in mathematics. Established by friends of the late Dr. Dio Lewis Holl and his widow, Mrs. Irma Holl.

**Phi Mu Epsilon Award.** For a Junior. Value: $15. Qualifications: The student who has completed sophomore calculus and holds the highest scholastic average in freshman and sophomore mathematics and in general scholarship.

**Science Women's Club Award.** For a Senior Woman. Value: A scientific book in her major field. Qualifications: Highest cumulative average up to and including the winter quarter of her senior year, who has not previously won the award.

**Sigma Delta Epsilon Award.** To an Undergraduate Woman. Value: A certificate. Qualifications: Outstanding in the fields of mathematical, biological, physical or related sciences on the basis of scholarship and promise of initiative in carrying on research.

Science Scholarships

**Archer-Daniels-Midland Company Scholarship.** For a Senior in Chemistry or Chemical Engineering. Value: $500. Qualifications: High scholarship, balanced achievement in all fields of study; character, extracurricular activities, financial need. Established by the Archer-Daniels-Midland Company. Apply to: Departments of Chemistry or Chemical Engineering.

**Collins Radio Company Scholarship in Physics.** For a Senior. Value: $100. Qualifications: Highest quality point average; worthiness and competence. Established by the Collins Radio Company of Cedar Rapids, Iowa. No applications to be made.

**General Electric Scholarship in Industrial Administration.** For a Senior. Value: $650. Qualifications: Awarded to the outstanding senior student recommended by the department. Scholarship, character, extracurricular activities, superior technical and administrative potential. No applications to be made.

**W. I. Griffith Radio-Television Scholarship.** For a Freshman. Value: $100. Qualifications: Upper quartile of his high school class, who, through his record of interest both in school and out, demonstrates a desire to concentrate in the area of radio and television, or who wishes to combine the study of radio and television with some other major course of study. Established in 1956 by Radio Station WOI in memory of W. I. Griffith, former director of Radio at Iowa State College, and pioneer in the field of educational broadcasting. Apply to: Dean of Science.

**Iowa Science Talent Search Scholarship.** For High School Seniors interested in science. Value: $100, $200, $300. Qualifications: Interest, ability and participation in a scientific project; must enter the National Talent Search conducted by the Science Clubs of America. For additional information write: F. E. Brown, Department of Chemistry, Iowa State College.

**KETC-Iowa State College Summer Television Scholarship.** For an advanced student enrolled in the radio and television training program at Iowa State College. Value: $500. Qualifications: Must be in good standing, having demonstrated professional interest in television broadcasting as a career, showing outstanding promise of success. Established in 1957 by the St. Louis Educational Television Commission and the Iowa State College alumni. No applications to be made.
NATIONAL ASSOCIATION OF MANUFACTURERS SCHOLARSHIPS. For Sophomores. Value: $1,000. Qualifications: Must be currently engaged in a course of study leading to a bachelor's degree in one of the major fields of business administration, science, engineering or mathematics; must plan to enter the teaching profession upon completion of his undergraduate program. Prime consideration will be the financial need. Established in honor of the retiring president of the National Association of Manufacturers, and is offered in recognition of the teaching profession. Apply to: Scholarships and Awards Committee, 101 Building H.

NATIONAL SCIENCE TALENT SEARCH SCHOLARSHIP. For High School Seniors interested in science. Value: Varies from $100 to $2,800. Qualifications: Interest, ability and participation in a scientific project. Established by the Westinghouse Electric Corporation for the purpose of promoting education and science. Apply to: Science Teacher, or High School Principal, or write directly to: Science Clubs of America, 1719 N Street, N.W., Washington 6, D. C.


WEED BROADCASTING SCHOLARSHIP. For a Senior or Graduate Student. Value: $500. Qualifications: Enrollment at Iowa State College in good standing; must have demonstrated a professional interest in radio or television broadcasting as a career, showing outstanding promise of success in the field. Established by Joseph J. Weed, president of Weed and Company, New York, for students seeking professional training and experience in radio or television at Iowa State College. Apply to: Director of WOI Radio-Television, Service Building.

WTTW-IOWA STATE COLLEGE SUMMER TELEVISION SCHOLARSHIP. For an advanced student enrolled in the radio and television training program at Iowa State College. Value: $500. Qualifications: Must be in good standing, having demonstrated a professional interest in television broadcasting as a career, showing outstanding promise of success in the field. Established in 1956 by the Chicago Educational Television Association and the Iowa State College alumni. No applications to be made.

Curriculum in Science

Leading to the degree of Bachelor of Science.

The curriculum in Science is designed so that the student may secure an adequate background in the sciences and general studies. It allows considerable latitude for personal choice. During the first two years, the student is expected to work in several fields of learning in order to discover his individual aptitudes and to lay a broad foundation for later specialization.

Group Requirements

As a prerequisite to graduation, to insure breadth of educational experience, each student must complete at some time during the four years a minimum of 15 credits in each of the seven groups named below:

(1) Written and spoken English
(2) Mathematics; statistics (Wherever the semicolon appears in this list it means "and/or").
(3) Chemistry; physics; geology
(4) Botany; zoology; bacteriology; genetics
(5) Economics; sociology; psychology; government
(6) History; literature; philosophy
(7) Modern language
General Requirements

(1) Total credits for graduation, 192, exclusive of these courses:
   (a) For men, six quarters in Military, Naval or Air Science (for six credits), and six quarters of Physical Education (without credit).
   (b) For women, two additional credits in Physical Education.
   (c) Library 106D.

(2) Government 315 (may be included as part of the requirement in Group 5).

(3) One major, minimum of 30 credits, and two minors, totaling 30 credits, related to each student's basic educational objectives, each exclusive of the Group Requirements.

The student will plan his program as follows:

**Freshman Year**

The freshman year will include 48 credits. During this year, the student must complete 9 credits in written English (Group 1) and at least 10 credits in mathematics (Group 2). In addition, 24 to 27 credits will be chosen from courses offered by departments in Groups 3, 4, or 5, with more than one group represented. Students in Naval Science may postpone completion of group requirements equivalent in credits to the required work in Naval Science. Normally, the freshman program will not include courses in Group 6 or Group 7.

**Sophomore Year**

The sophomore year will include 48 credits. If only four of the seven groups were represented in the freshman year, the sophomore program must include courses in a fifth group (minimum of 3 credits). During the sophomore year the student may experiment further with the basic fields of learning, in order to discover aptitudes and interest, or may elect courses in a field already chosen, including related work suggested by the major department. Normally, the student should know by the third quarter of the sophomore year what his major will be.

**Junior and Senior Years**

Requirements:

(1) The completion of whatever group requirements remain after the freshman and sophomore years.

(2) The completion of the major and two minors (defined under "General Requirements").

(3) Elective courses.

Each student must work out a complete program of courses for the junior and senior years in conference with the head of the major department or his representative. The total program for the four years will contain a minimum of 192 credits, exclusive of required Military or Air Science and Physical Education. Each program must be approved by the Dean of Science.

A major consisting of at least 30 credits may be chosen from one of the following fields:

**Bacteriology:** General and systematic; dairy; soil; veterinary; pathogenic; food; sanitary; household; physiological and fermentation.

**Botany:** Ecology; morphology; mycology; pathology; physiology; systematic; preparation for applied botanical science; economic botany; plant protection, seed technology.

**Chemistry:** Analytical; bio-organic; bio-physical; enzyme; food and sanitary; inorganic and qualitative analysis; organic; physical; plant; physiological and nutritional; soil; textile; chemical technology.

**Climatology and Meteorology:** Individual programs with majors in agronomy, physics, geology, or some other field, with a minor in meteorology. No undergraduate major in meteorology is offered.

**Economics or Sociology:** Agricultural economics; consumption economics; general economics; industrial economics; general sociology; rural sociology.
Preparation for the study of law by completion of three years of study under the agricultural business curriculum in the Division of Agriculture followed by one year in a recognized law college, after which the degree Bachelor of Science in Agriculture will be awarded by Iowa State College.

Food Technology: Individual programs planned with emphasis on the phase of the field of special interest to the student. For suggested elements in the program, see the curriculum in chemical technology, page 99. Freshman should elect Zool. 104, 105 and Bot. 101C. For sophomores, social science electives should replace Chem. 201, 202. Three months of practical experience, approved by the Administrative Committee, in a branch of the food industry of particular interest to the student is required before graduation. This program requires a sequence in mathematics, physics and chemistry essential for graduate work in food technology.

Foreign Trade and Service Programs: Individual programs emphasizing preparation for (1) the foreign trade section of a business, (2) a government agency, or (3) technical work in engineering, agriculture, or in one of the sciences.

General Science: See below.

Genetics: Heredity in relation to the improvement of animals and plants.

Geology: Economic; agricultural; general.

History, Government or Philosophy: Economic history and government.

Industrial Administration: Financial organization, administration, management; marketing structures, functions, management; legal framework and principles of business organizations and operations; managerial, cost and tax accounting; industrial risk bearing and risk distribution; regulation of business; business forecasting; transportation and traffic management.

For business and management for the building industry, see the head of Architecture or the head of Industrial Administration.

Industrial Psychology.

Mathematics: Applied (mechanics and physical); statistics; analysis and geometry.

Naval Science: Courses in naval science to meet requirements of the Navy Department.

Physical Education: For men, in combination with a minor in another science. Individual programs in physical education are planned for the student by the head of the department with the approval of the dean.

Physics: Applied; general; mathematical; bio-physics.

Statistics: Statistical methods in the biological, social, physical and engineering sciences; mathematical statistics.

Technical Journalism: Reporting; editing; management of newspapers and technical journals; advertising; radio journalism; outdoor writing.

Zoology: Economic zoology; entomology; cytology; embryology and histology; parasitology; physiology; protozoology; wildlife conservation; apiculture.

The two minors, totaling 30 credits, should be related to the student's basic educational objectives and should be composed of courses ordinarily of senior college rank. These minors may be chosen from the list of fields which appears above, or from the following: Air Science, English, Military Science, Modern Languages, Philosophy, Physical Education for Women, Radio, Speech, Television, or courses in other divisions. If justified by the student's vocational objective, a minor may include closely related courses offered by more than one department.

General Science

Students who do not wish to declare a departmental major, but desire a broader training in Science, may select at the beginning of their junior year, the major in General Science. The academic program to be worked out in conferences and to be approved by the Dean of Science must include:

1) Four related fields of study; each field to consist of from nine to twenty-one credits to total sixty credits. All of these courses must be based on a prerequisite of three or more courses. Concentrations in these fields of study may include courses from any
department in the division, from departments outside the division, and from the following areas of instruction:

- English and Speech: Literature, composition, speech
- Modern Languages
- Physical Education for Women
- Preparation for Study of Medicine (see below)
- Preparation for Study of Law (see below)
- Radio and Television (see page 222).

Secondary School Teaching: biological, physical or social sciences

Combined program leading to the degrees Bachelor of Science and Doctor of Veterinary Medicine (see below)

(2) Electives chosen only from courses numbered 300 or above.

Special Programs for Exceptional Students

A few exceptional students in the Division of Science will be permitted to do special individual work in the junior and senior years if such a program is likely to meet their needs better than the regular program. Students who wish to enter individual programs must have an all-college average of at least 3.0 and an average higher than 3.0 in the major field of study. The student's advisers must be satisfied that the student has the physical and mental health, the initiative and intellectual curiosity, the basic drive, and other personal qualities which are necessary for success. The candidacy must have the approval of the Dean of Science who, in consultation with the student and with others concerned, will appoint a committee to direct the work. The plan must be approved by the Dean of Science. Candidates should apply at the office of the Dean of Science.

The student and his committee will plan as many economies as possible in the program in order to allow time for the development of an individual project in the major field. The plan will not permit the elimination of any essential knowledge or discipline and should bring about better integration and balance in the student's work. It is hoped that exceptional students will be able to use individualized programs as a means of developing their powers as fully as possible.

Preparation for the Study of Medicine

Students preparing for the regular curriculum in veterinary medicine, (see page 101) will take the preliminary years in the Division of Science as outlined on pages 95 and 96 with modifications suggested by the student's adviser. Students in Veterinary Medicine who wish to receive both the degrees Doctor of Veterinary Medicine and Bachelor of Science will take at least three years' work in the curriculum in Science. Such a program must have the approval of the Dean of Science and the Dean of Veterinary Medicine. See also restricted enrollment in the Division of Veterinary Medicine, page 104.

Students preparing for the study of human medicine will take at least the work of the first three or four years of the curriculum in science. The general outline, as described on page 95, will be followed with modifications in terms of the requirements of the medical school which the students plans to enter. Modifications will be suggested by the student's adviser and submitted to the Dean of Science for approval.

Preparation for the Study of Law

Preparation for the study of law by the completion of three years of study under the curriculum in science followed by one year in a recognized law college, after which the degree Bachelor of Science will be awarded by this college. For this purpose, students have used majors in Economics or Sociology, General Science, History or Government, Industrial Administration and Industrial Psychology.

Curriculum in Agricultural Business and Rural Sociology

Administered jointly by the Division of Agriculture and the Division of Science in the Department of Economics and Sociology. See pages 38 to 40 and 96.
Curriculum in Chemical Technology

Leading to the degree of Bachelor of Science.

Freshman Year

Each student will be required to include in his schedule, in addition to the courses listed below, Library 106D (Spring); Physical Education each quarter (for women, 1 credit for the year; required of men without credit); Military Science 111, 112, 113 or Air Science 141, 142, 143 (men, 1 credit each quarter) or Naval Science 111, 112, 113 (men, 3 credits each quarter).

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
</tr>
<tr>
<td>General Chemistry 4</td>
<td>General Chemistry 4</td>
<td>Qualitative Analysis 4</td>
</tr>
<tr>
<td>Prin. of Composition 3</td>
<td>Prin. of Composition 3</td>
<td>Prin. of Composition 3</td>
</tr>
<tr>
<td>Engl. 101 3</td>
<td>Engl. 102 3</td>
<td>Analytical Geometry 3</td>
</tr>
<tr>
<td>College Algebra 5</td>
<td>Plane Trigonometry 5</td>
<td>Math. 103 5</td>
</tr>
<tr>
<td>Math. 102 5</td>
<td>Math. 102 5</td>
<td>Air Science 141, 142, 143 (men, 1 credit each quarter)</td>
</tr>
<tr>
<td>Reading Knowledge of German 3</td>
<td>Reading Knowledge of German 3</td>
<td>Naval Science 111, 112, 113 (men, 3 credits each quarter)</td>
</tr>
<tr>
<td><strong>Total Credits:</strong> 15-18</td>
<td><strong>Total Credits:</strong> 15-18</td>
<td><strong>Total Credits:</strong> 15-18</td>
</tr>
</tbody>
</table>

*Students qualifying for an accelerated program will elect Chem. 102A, 103A, and 102A rather than Chem. 101, 102, 103.

Sophomore Year

Each student will be required to include in his schedule each quarter, in addition to the courses scheduled below, Physical education (for women, one credit for the year; required of men without credit); Military Science 211, 212, 213 or Air Science 241, 242, 243 (men, 1 credit for each quarter) or Naval Science 211, 212, 213 (men, 3 credits per quarter).

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
</tr>
<tr>
<td>Quantitative Analysis 5</td>
<td>Organic Chemistry 5</td>
<td>Physical Chemistry 3</td>
</tr>
<tr>
<td>Chem. 214 5</td>
<td>Chem. 230, 235 5</td>
<td>Chem. 224 3</td>
</tr>
<tr>
<td>Organic Chemistry 3</td>
<td>Differential &amp; Integral 4</td>
<td>Organic Chemistry 5</td>
</tr>
<tr>
<td>Chem. 234 3</td>
<td>Calculus II 5</td>
<td>Chem. 230, 235 5</td>
</tr>
<tr>
<td>Differential &amp; Integral Calculus I 4</td>
<td>Math. 212 4</td>
<td>Differential &amp; Integral Calculus III 4</td>
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<tr>
<td>Math. 211 4</td>
<td>Phys.* 212 5</td>
<td>Math. 213 4</td>
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<td>General Physics 5</td>
<td>Electives 3</td>
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<tr>
<td>Phys.* 211 5</td>
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<td>Phys.* 215 5</td>
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<tr>
<td><strong>Total Credits:</strong> 18-20</td>
<td><strong>Total Credits:</strong> 18-20</td>
<td><strong>Total Credits:</strong> 18-20</td>
</tr>
</tbody>
</table>

*Physics 221, 222, 223 may be substituted for Physics 211, 212, 213.

Junior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
</tr>
<tr>
<td>Inorganic Chemistry 2</td>
<td>Inorganic Chemistry 2</td>
<td>Quantitative Analysis 2</td>
</tr>
<tr>
<td>Chem. 201* 2</td>
<td>Chem. 202* 2</td>
<td>Chem. 316 5</td>
</tr>
<tr>
<td>Physical Chemistry 5</td>
<td>Quantitative Analysis 5</td>
<td>Organic Chemistry 5</td>
</tr>
<tr>
<td>Chem. 325, 327 5</td>
<td>Chem. 315 5</td>
<td>Chem. 330 5</td>
</tr>
<tr>
<td>American Government 3</td>
<td>Physical Chemistry 5</td>
<td>Electives 7</td>
</tr>
<tr>
<td>Govt. 315 3</td>
<td>Chem. 326, 327 5</td>
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<tr>
<td>Speech Making 3</td>
<td>Electives 5</td>
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<tr>
<td>Sp. 311 3</td>
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<td></td>
</tr>
<tr>
<td>Electives 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits:</strong> 17</td>
<td><strong>Total Credits:</strong> 17</td>
<td><strong>Total Credits:</strong> 17</td>
</tr>
</tbody>
</table>

*Unless 202A has been previously completed, as in the accelerated program, in which case, electives will be chosen.

Senior Year

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Winter Quarter</th>
<th>Spring Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
<td><strong>Credits</strong></td>
</tr>
<tr>
<td>Chemical Engineering Unit Operations 3</td>
<td>Chemical Engineering Unit Operations 3</td>
<td>Chemical Engineering Unit Operations 3</td>
</tr>
<tr>
<td>Chem.E. 361 3</td>
<td>Qualitative Analysis 4</td>
<td>Electives 14</td>
</tr>
<tr>
<td>Electives 14</td>
<td>Electives 4</td>
<td>Electives 10</td>
</tr>
<tr>
<td><strong>Total Credits:</strong> 17</td>
<td><strong>Total Credits:</strong> 17</td>
<td><strong>Total Credits:</strong> 17</td>
</tr>
</tbody>
</table>

Of the 58 elective credits, at least 5 must be in advanced chemistry other than Chem. 495, at least 9 must be in biological science, at least 9 must be in history, literature, philosophy, or advanced English composition, at least 9 must be in economics or industrial administration, and at least 15 must be in advanced chemistry, physics, mathematics, biological science, or chemical engineering. (11 not specified).
Curriculum in Physical Education for Men

Leading to the degree of Bachelor of Science.

One unit (one year) of high school algebra is required for admission into this curriculum. One hundred and ninety-eight credits must be earned in accordance with the following regulations for graduation:

<table>
<thead>
<tr>
<th>Fall Quarter</th>
<th>Credits</th>
<th>*Freshman Year</th>
<th>Winter Quarter</th>
<th>Credits</th>
<th>Spring Quarter</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prin. of Composition</td>
<td>3</td>
<td>Prin. of Composition</td>
<td>3</td>
<td>Engl. 101</td>
<td>3</td>
<td></td>
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<tr>
<td>Engl. 101</td>
<td>3</td>
<td>Engl. 102</td>
<td>3</td>
<td>World Geography</td>
<td>3</td>
<td></td>
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<tr>
<td>Geol. 200</td>
<td>3</td>
<td>Geol. 304</td>
<td>3</td>
<td>Phys. Ed. Techniques</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Introd. to Geology</td>
<td>3</td>
<td>P.E.M. 214, 215, 219</td>
<td>3</td>
<td>P.E.M. 214</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>P.E.M. 213</td>
<td>3</td>
<td>P.E.M. 216, 217, 220</td>
<td>3</td>
<td>Psch. 104</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Human Conservation</td>
<td>3</td>
<td>Soc. 134</td>
<td>3</td>
<td>Animal Biology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Psych. 174</td>
<td>3</td>
<td>Zool. 104</td>
<td>3</td>
<td>ROTC</td>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>3</td>
<td>P.E.M. 216, 217, 220</td>
<td>3</td>
<td>ROTC</td>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td>Hvy. 204</td>
<td>3</td>
<td>Geol. 305</td>
<td>3</td>
<td>Physical education and Library 106D (Spring)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*This program will be modified to allow qualified students to carry mathematics and chemistry each quarter.

**Sophomore, Junior and Senior Years**

The student shall, with the aid of his adviser, submit a degree program for the approval of his department head and the Dean of the Science Division during the spring quarter of his sophomore year.

Such a degree program shall include:

1. Subjects giving a general cultural background.
2. A minimum of forty-five credits in physical education, but not more than sixty credits may apply for the degree.
3. Courses required to fulfill the general requirements for professional teacher certification. These include V.Ed. 204, 305, 426; Psych. 104, 315, 334 and Gov't. 315. In addition, special methods and practice teaching are required.
4. Courses adequately supporting the proper development of the major field.
5. Courses toward the development of several minor areas will be selected in accordance with individual interests. Certification requires a minimum of twenty-three credits in each area. Suggestions for selection include: agricultural sciences, driver training, English, general science, history-social science, industrial education, journalism and radio, mathematics. Broader certification in the areas of science and social studies may be established with the completion of thirty-six hours in the respective areas.

Division of Veterinary Medicine

IVAL A. MERCHANT, D.V.M., Ph.D., Dean of Division of Veterinary Medicine

Veterinary Administration Building, Room 200

The Division of Veterinary Medicine of Iowa State College was established in 1879 and is now the oldest school of veterinary medicine in the United States.

It includes the Department of Anatomy, Hygiene, Medicine and Surgery, Obstetrics and Radiology, Pathology, and Physiology and Pharmacology. Instruction in chemistry and other related sciences is provided by departments outside the division. Aside from the six strictly educational departments and the hospital and ambulatory clinics, there are also the Veterinary Medical Research Institute and the Iowa Veterinary Medical Diagnostic Laboratory, which give the student opportunity to observe those phases of veterinary medicine for which these laboratories are especially responsible.

The location of the college in the center of the richest livestock country in the world provides a rare opportunity for the veterinary student to study animal industry; it also enables him to observe a wealth of clinical cases both at the hospital clinic and under general practice conditions through the ambulatory clinic.
A minimum of two years of prescribed preprofessional college work, with a creditable academic average, is required for admission to the professional curriculum in veterinary medicine. (See entrance requirements on page 103.) Students in Veterinary Medicine who wish to receive both the degrees Doctor of Veterinary Medicine and Bachelor of Science will take at least three years' work in the curriculum in Science. Such a program must have the approval of the Dean of Science and the Dean of Veterinary Medicine. The professional curriculum extends over a period of four years and leads to the degree of Doctor of Veterinary Medicine.

Candidates for graduation must be twenty-one years of age, of good moral and professional character, must have at least 2 quality points per credit in all courses taken in the professional curriculum, and must be approved by all departments of the division, to secure the degree of Doctor of Veterinary Medicine.

Opportunities for Veterinarians

PRIVATE PRACTICE. The extent and importance of the livestock industry in the United States assure the competent veterinarian of an excellent opportunity to establish a professional career in private practice with substantial compensation for his services. The success of livestock production is becoming more and more a problem of control of animal diseases. The veterinarian has definite responsibilities in a successful animal industry and the majority of veterinarians enter some phase of the practice of veterinary medicine upon graduation. In recent years there has been a developing tendency toward specialization in certain fields of practice, for example, in breeding diseases, or in cattle, swine, or poultry practice. One of the currently attractive fields of professional work is what is referred to as "small animal practice" in larger towns and cities. Many veterinarians now maintain private hospitals adequately equipped for the diagnosis and treatment of diseases of household pets and devote their entire time to this field of specialization.

THE AGRICULTURAL RESEARCH SERVICE. The Agricultural Research Service of the United States Department of Agriculture employs more veterinarians than any other agency, many hundreds being utilized in its widespread national activities. Its services include federal meat inspection, animal quarantine, control and eradication of preventable animal diseases, supervision of the production of biological products and an extensive program of animal disease research, both in laboratories and in the field. These positions are obtained through the United States Civil Service Commission by examination and are ordinarily available for those who desire to enter this service.

STATE AND MUNICIPAL GOVERNMENTS. Every state has a state veterinarian or similar officer often with a number of assistant veterinarians whose duties are to investigate and control preventable diseases of animals by enforcing the laws and regulations established for this purpose. Veterinary medical health officials cooperate with those of human medicine in state health matters as many animal diseases are communicable to man. Many cities employ veterinarians on a full or part time basis as sanitarians in their public health departments. Their responsibilities are to insure the healthfulness of the cities' food supply with special reference to milk and meat products through the inspection of local abattoirs and city markets. The milk supply is supervised as to its source and sanitary conditions under which it is produced and the health of the dairy herds supplying the milk is investigated.

VETERINARY CORPS, UNITED STATES ARMY AND UNITED STATES AIR FORCE. Students in veterinary medicine are usually deferred by their local Selective Service Boards in order to complete their professional education. Upon graduation, however, they are required to serve two years in some branch of the Armed Services. This service is provided by the Army and by the Air Force. Upon entering the service, the veterinary graduate is commissioned as a First Lieutenant. If he wishes to remain in service, advancement is made in the various grades through the rank of colonel, with one officer appointed in the grade of brigadier general. One of the major responsibilities of the veterinary corps officers is determining that food products, especially those of animal origin, issued to the Armed Services are wholesome and suitable for food purposes. Of course, the protection of all animals and birds essential to war activities is a responsibility of the Army and Air Force veterinarians. His familiarity with diseases transmissible from animals to man, his train-
ing in laboratory techniques and knowledge of parasitic diseases make him a valuable addition to the public health units of the military service.

Commercial Work. Veterinarians are extensively employed by commercial concerns engaged in the production of biological and pharmaceutical products used in the control and treatment of both animal and human diseases. These positions may require some special training and include both technical laboratory and field work.

Education and Research. Veterinarians qualified by special training are in demand to fill teaching and research positions in veterinary medical and agricultural colleges. Almost every agricultural school has a veterinary medical department employing several veterinarians and the colleges of veterinary medicine of the country are constantly on the lookout for veterinarians qualified for institutional work. Research veterinarians are attached to the Agricultural Experiment Stations of the various states in addition to those employed by the United States Agricultural Research Service.

Public Health Service. Many veterinarians are employed in public health. The Communicable Disease Center of the United States Public Health Service assigns veterinarians in their employ to various sections of the country where special disease problems exist. Cities and small towns often employ veterinarians to aid in the control of the food supply and also to aid in programs controlling diseases which are transmissible from animals to man, such as rabies. Some of these positions are on a full time basis but many are part time employment. In many of the states a veterinarian is employed by the State Health Department to assist in the field of epidemiology and health education. Veterinarians are also employed by the Pan-American Sanitary Bureau and by the World Health Organization.

Other Fields of Service. Many private interests now employ veterinarians. Among these are artificial breeding organizations, zoological societies, livestock ranches, humane societies and the fur-bearing industries.

Honors and Awards

Award of the Women's Auxiliary to the American Veterinary Medical Association. This is an annual award of $25 to a senior veterinary student. The selection of the recipient is based upon some creative activity, other than scholarship, carried on by the student during his junior and senior years.

Borden Scholarship Award in Veterinary Medicine. The Borden Company Foundation of New York has established an annual scholarship award of $300 to be presented to the student in veterinary medicine who has achieved the highest average grade of all students in the veterinary curriculum preceding his senior year. The amount of the award is presented to the recipient in the Fall Quarter of his senior year.

G. G. Graham Prizes. These are cash prizes awarded annually to the two outstanding senior students in clinical medicine on the basis of scholarship, attitude and general adaptability.

George Judisch Scholarship Prize. This prize consists of the initiation fees and annual dues for four years of membership in the American Veterinary Medical Association, including subscription to the official journal, and is awarded each year to the senior student with the highest scholastic record in the Division of Veterinary Medicine.

Iowa State Veterinary Medical Alumni Association Awards. These are annual cash awards of $100 each to a sophomore and to a junior student of veterinary medicine. The awards are based upon general aptitude, scholarship, financial need and extra-curricular activities.

Phi Zeta. Members are chosen from those who rank scholastically in the upper tenth of the junior class and the highest fourth of the senior class. Character and qualities of leadership are also considered.

Riser Small Animal Award. This award is made annually to the senior student who has shown the greatest proficiency in small animal clinical medicine.

Paul F. Starch Phi Zeta Award. This award is made annually to a freshman veterinary student who, at the end of the freshman year, has shown those qualities of character, interest, and leadership which the Society of Phi Zeta emphasizes.
BURTON C. THOMSON AWARD. This award was established by the Iowa State College Veterinary Medical Alumni Association commemorating the death of Captain Burton C. Thomson in World War II. The annual award of $100 to a freshman student of veterinary medicine is based upon general integrity, scholarship and adaptability.

VETERINARY MEDICAL SOCIETY. All veterinary students are members of the Iowa State Junior Chapter of the American Veterinary Medical Association. The bi-weekly meetings of the society, devoted to discussions of professional topics, promote the literary and social development of the members.

OTHER HONOR SOCIETIES. Students of veterinary medicine are also eligible for membership in the national honor societies of Phi Kappa Phi and Gamma Sigma Delta, and graduate students to membership in Sigma Xi.

Entrance Requirements

Admission to the Division of Veterinary Medicine is granted only at the beginning of the fall quarter. Applicants for admission must file a certificate showing that their high school record meets the entrance requirements as set forth on page 15. College credits of the preprofessional work must average at least 2.25 on a four-letter marking system with "A" as the highest mark and "D" as the lowest passing mark (for explanation of the marking system, see page 28.), if the application is to receive consideration by the Committee on Selective Admission. The above scholastic requirements are minimum and do not require automatic admission if fulfilled. For other factors in selective admission, see Restricted Enrollment on page 104.

In selecting the candidates for the first-year class, a personal conference may be required with members of the veterinary faculty, or other persons designated by the Dean. High school records, scholastic performance in preprofessional studies, aptitude rating, evidence of good character, and satisfactory personality will be given special consideration in the acceptance of applicants. Other qualifications being equal, residents of Iowa will be given preference.

Those who are applying for admission in September must file high school records and formal applications for admission by March 1. A transcript of all college courses completed up to that time should be sent to the Registrar. All courses must be completed by June 15 and the applicant must include a list of those courses which he has taken in the preveterinary program.

Applicants for admission must present 1½ units of algebra and 1 unit of geometry from an approved high school, and a total of not less than two years (90 quarter or 60 semester credits) of work in an approved college or university. The college credits must include:

*Must include 3 qr. crs. (2 sem. crs.) of speech-making (Engl. 311 or equivalent).

**Must include 3 qr. crs. (2 sem. crs.) of animal nutrition (AH 318 or equivalent).

In view of the animal husbandry and poultry husbandry requirements it is advisable for the student to take his preveterinary work at an institution where those courses are given. The following courses are suggested but not required as electives: agricultural economics, business law, general psychology and embryology. A brief, non-credit course in library instruction is required for graduation and should be taken in the preveterinary program.

Students who desire to take preprofessional work at Iowa State College will enroll in the Division of Science.
Restricted Enrollment

Recently, the college has been receiving applications for admission to the curriculum in veterinary medicine from more students than can be effectively trained with the present educational facilities. For this reason, it has become necessary to limit the enrollment in the first-year class in veterinary medicine to approximately seventy students.

Readmission

A veterinary student who voluntarily withdraws from college, or who is dropped for cause, forfeits his standing and must apply for readmission at any future time.

Curriculum in Veterinary Medicine

Leading to the degree of Doctor of Veterinary Medicine.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Quarter</strong></td>
<td>Winter Quarter</td>
</tr>
<tr>
<td>Physiological Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Chem. 374</td>
<td></td>
</tr>
<tr>
<td>Microscopic Anatomy V. Anat. 101</td>
<td>5</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
</tr>
<tr>
<td>Pathogenic Bacteriology V. Hyg. 225</td>
<td>5</td>
</tr>
<tr>
<td>Virology V. Hyg. 226</td>
<td>4</td>
</tr>
<tr>
<td>Genl. Bacteriology V. Hyg. 224</td>
<td>6</td>
</tr>
<tr>
<td>Mammalian Physiology V. Phys. &amp; Pharm. 265</td>
<td>6</td>
</tr>
<tr>
<td><strong>Third Year</strong></td>
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<td>Obstetrics V. Obst. &amp; Rad. 345</td>
<td>5</td>
</tr>
<tr>
<td>Pharm. &amp; Therapeutics</td>
<td>4</td>
</tr>
<tr>
<td><strong>Fourth Year</strong></td>
<td></td>
</tr>
<tr>
<td>Applied Anatomy V. Anat. 402</td>
<td>3</td>
</tr>
<tr>
<td>Infectious Diseases V. Hyg. 421</td>
<td>4</td>
</tr>
<tr>
<td>Disturbances of Reproduction V. Obst. &amp; Rad. 440</td>
<td>4</td>
</tr>
<tr>
<td>Applied Avian Pathology V. Path. 450</td>
<td>3</td>
</tr>
<tr>
<td><strong>Credit given this quarter for work extending throughout the year</strong></td>
<td></td>
</tr>
</tbody>
</table>

**R indicates course is "required" without credit.
Graduate College

DEAN RALPH MALCOLM HIXON, Ph.D., Beardshear Hall, Room 110

Iowa State College is a technical institution. Its Graduate College offers to qualified students opportunity to pursue advanced courses and to undertake research in agriculture, engineering, home economics, science and veterinary medicine. No major graduate work is offered in liberal arts subjects. Most of the departments give courses and direct research leading to the degree of Master of Science; a smaller number offer major work leading to the degree of Doctor of Philosophy. Broad scholastic interest without concern for specific application is expected of candidates for those degrees.

The specialized division of labor in modern society has created demands for advanced study oriented around vocational objectives rather than creative study and research. The professional degrees, Master of Engineering, Master of Landscape Architecture and Master of Vocational Education, have been established to meet that need in the respective fields. They permit greater program latitude than is permitted for the degree of Master of Science but do not necessarily indicate progress toward the degree of Doctor of Philosophy.

Admission

I. APPLICATION AND TRANSCRIPT OF RECORD. The prospective graduate student may secure application blanks for admission to the Graduate College from either the Registrar or the Dean of the Graduate College. He should forward these blanks, together with official transcripts and statements of quartile rank, to the Registrar or the Dean of the Graduate College, at least a month before the opening of the quarter when he wishes to matriculate. If the student has taken the Graduate Record Examination, the individual report chart should also be submitted. If the application is approved, an admission slip is sent by the Registrar to the Dean of the Graduate College and a copy is sent to the student.

II. QUALIFICATIONS. An applicant who is a graduate of an institution in the United States whose requirements for the Bachelor's degree are substantially equivalent to those at Iowa State College, and who ranks in the upper one-half of his class, may be admitted to the Graduate College. Admission does not constitute acceptance as a candidate for a degree.

Admission to the Graduate College may not be granted to a graduate of an institution in the United States which is not accredited by a recognized regional association.

III. RESTRICTED ADMISSION. An applicant who is a graduate of an accredited university in the United States, but who does not rank in the upper one-half of his class, may be granted restricted admission if such consideration seems justified. A student who does not contemplate candidacy for a degree may register for workshops, off-campus classes, or non-degree study by submitting evidence that he holds the baccalaureate degree.

Graduates of recognized universities located outside the United States may be granted restricted admission only.

IV. ADVANCEMENT TO CANDIDACY. Advancement to candidacy requires approval of the Graduate Committee. The requirements are indicated on pages 109 and 110.

V. PROBATION. The Graduate Committee may place a student on probation for failure to meet scholastic or other requirements. Generally registration beyond the third quarter will be refused to a student whose scholastic average is appreciably lower than B.

Registration and Classification

I. PLANNING GRADUATE STUDY. Scholastic competence, independence, and maturity of thought should have dominance over other objectives of graduate study. The student must accept responsibility for his 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 him confidence in his own judgments. As soon as possible, in conference with
the head of his department, the student should select the professor with whom he wishes to major and in consultation with him should outline his program of study.

II. TIME CARDS. Each quarter the student makes out classification schedules called “time cards”, which can be obtained in the departmental offices. These are signed by the major professor and the head of the major department. If no major department has been chosen, the Dean of the Graduate College is in charge.

III. CREDITS. Classification in courses carrying full graduate credit is limited to a maximum of fifteen credits per quarter. The maximum, if part of the work is supporting (not for graduate credit), is sixteen credits. Schedules for graduate assistants are limited to a maximum of eleven credits; for full-time staff members, to five credits.

Courses chosen for graduate credit must be from among those listed in the graduate catalog as giving such credit. Other courses may be taken as supporting courses but not credited toward an advanced degree.

Graduate students (even though course and residence requirements have been met) must register in any quarter in which the facilities of the institution are being used in preparation of thesis or in preparation for examination. The number of credits under these circumstances shall be consonant with the amount of work done, laboratory facilities used, and staff direction involved.

IV. AUDITING. Permission to audit a class is secured by listing the course on the time cards under supporting courses and writing the word “audit” in the credits column. Each audited course will reduce the permitted credit load by one, but fees will be assessed on the basis of catalog credit.

V. ADVANCED CREDIT FOR SENIORS. Under special circumstances, a department head may request from the Graduate Committee permission to classify a senior student in certain graduate courses if he is within six credits of fulfilling requirements for the baccalaureate degree. Then, after the student has received his bachelor’s degree and has been registered in the Graduate College, the head of his major department may request that the credits so received be applied toward an advanced degree.

VI. CLASSIFICATION WITH THE DEAN. The student presents the time cards, properly filled out and signed, at the office of the Dean of the Graduate College for checking. After they have been approved and signed by the dean, the student leaves two in that office and takes two to the office of the Registrar, where he secures class cards and fee cards. Fees are assessed by the office of the Registrar and paid at the office of the Treasurer. For fees required of graduate students see page 19.

VII. CHANGES IN CLASSIFICATION. Changes in classification are made by filing in duplicate a “change in Graduate College classification” slip, approved by the major professor, department head, and Dean of the Graduate College. A course may be dropped (X) without prejudice on or before the second Friday of the quarter.

VIII. INTERIM CLASSIFICATION AND WORKSHOPS. Registration for special work between quarters, for workshops and similar programs cannot exceed one credit for each week that the student is in residence. The fee is $8 per credit.

IX. EXTENSION AND OFF-CAMPUS CLASSES. Classes away from the campus in some areas of engineering and education are taught by members of the Engineering and Vocational Education staffs, who are either members of the Graduate Faculty or officers of instruction. Credits earned in such classes cannot be considered a part of the one and one-half year minimum residence for the doctor’s degree nor the thirty weeks minimum for the Master of Science degree. For vocational masters’ degrees, credit beyond the present allowance of 9 credits will not be allowed for off-campus work unless the library, laboratory and other facilities are approved by the Graduate Committee prior to initiation of the student’s program.

X. CLASSIFICATION IN ABSENTIA. Graduate work by correspondence is not permitted, nor is it accepted in transfer. In exceptional cases, the Graduate Committee may authorize registration in absentia. Generally such registration is restricted for thesis preparation after completion of research or for research under special conditions. The total credit thus obtained cannot exceed that previously gained in residence, nor can those credits be used to reduce residence requirements.
Standard time cards are used and are clearly marked “In Absentia”. They must be approved by the head of the department and the Dean of the Graduate College. The student forwards the required fee of $3 per credit with the time cards.

XI. English Requirement. Each graduate student is required to take the qualifying examination in English at the time scheduled during the first quarter or summer term of residence. Those who fail the examination must report to the Writing Clinic for assistance. Further registration will be refused if the deficiency in English is not removed by the end of the third quarter of registration. The Graduate Committee may make an exception for students to whom English is not the native language.

XII. Medical Examination. Each new graduate student entering Iowa State College is required to have a physical examination. Students accepted for admission will be sent forms to be filled out by a physician and returned promptly by him to the Student Health Service. Any student unable to have his physical examination before coming to college will be given an examination by the College Health Service staff for a fee of $5.

Foreign students are required to carry health and accident insurance while in residence. The Institute of International Education offers a special policy which costs about $27 per year and provides protection from the time the student leaves home until his return. Inquiries should be directed to the Insurance Division, Institute of International Education, 1 East 67th Street, New York 21, New York.

XIII. Graduate Record Examination. Each graduate student may be required to take the Graduate Record Examination or such other graduate aptitude test as may be specified by the Graduate Faculty.

XIV. Time Limit. It is expected that all graduate work for an advanced degree shall be completed within a term of five years. (Period of service in the armed forces is not included.) Only in exceptional cases, on recommendation of the department concerned and approval by the Graduate Committee, is credit allowed for courses taken over a period of more than five years.

XV. Special Regulations for Students in Veterinary Medicine. Specially qualified graduates in scientific curricula, when the request has been approved by the Dean of Veterinary Medicine and the Dean of the Graduate College, may pursue work coincidentally toward the degrees of Master of Science and Doctor of Veterinary Medicine. The major graduate work of such students must be completed in courses not required in the undergraduate curriculum in veterinary medicine. A student taking advantage of this opportunity will classify with both the Dean of Veterinary Medicine and the Dean of the Graduate College.

Graduate Appointments

Fellowships, Graduate Assistantships, Industrial Fellowships and certain special research grants have been established at Iowa State College for the encouragement of graduate work and the promotion of research. These appointments are open to students who have been graduated from approved colleges in the highest quartile of their respective classes and who present the requisite undergraduate or graduate preparation.

Such appointments and research opportunities are available through the various departments of instruction, administrative committees and the Agricultural Experiment Station, the Engineering Experiment Station, the Industrial Science Research Institute, the Statistical Laboratory and the Institute for Atomic Research. Application blanks and further information may be secured by writing to the Dean of the Graduate College, Room 110, Beardshear Hall. These blanks should be returned to the dean's office not later than March 1. In most cases recommendations for appointment are made about April 1. Appointments are made throughout the year as vacancies occur.

Graduate Assistantships may pay a maximum of $225 per month and permit the holder to enroll for two-thirds of a full schedule or eleven credits per quarter. A Graduate Assistant is expected to give half-time service to the teaching or research projects of his department.

Special Research and Industrial Fellowships are offered each year either by the college or other agencies for the study of special problems. The stipend varies with the nature and importance of the work and the preparation of the candidate.
For registration fees, see page 18. The satisfactory completion of one appointment will ordinarily make a student eligible for reappointment.

Post Doctoral Study

Post doctoral students not holding appointments on the staff may be designated as collaborators and given staff privileges upon recommendation of the head of the department concerned through the office of the Dean of the Graduate College to the President. Those who are admitted from foreign countries on a student visa must register and classify as graduate students, as must also all who wish to have graduate credits recorded.

Graduate Study by Members of the Staff

I. MEMBERS OF THE STAFF ON FULL-TIME EMPLOYMENT. Any member of the research, instructional or extension staffs of the rank of instructor, associate or junior scientist, subject to the approval of the head of his department or section, may carry not to exceed five credits of graduate work per quarter, provided such does not interfere with his 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 concerned and of the President.

II. MEMBERS OF THE STAFF ON PART-TIME EMPLOYMENT. All adjustments as to amount of work to be taken for credit by members of the staff on part-time employment shall be fixed at time of appointment. In general, one additional credit of graduate work may be carried for each diminution by one-twelfth from full-time employment.

III. SUMMER SCHOOL. Other members of the staff may enroll in graduate work during the Summer Quarter if not on duty and not receiving salary from the College during this time. If holding the rank of professor or associate professor they cannot become candidates for degrees from this institution.

Requirements for the Degree of Master of Science

The following requirements must be met by all candidates for the degree of Master of Science. Further requirements may be prescribed by the major departments.

I. RESIDENCE. Three quarters, or a minimum of thirty weeks of full-time graduate study, must be spent in residence at Iowa State College.

Arrangements have been made whereby graduate students in certain departments may earn a portion of their residence credit at the State University of Iowa.

II. CREDITS. At least forty-five credits of acceptable graduate work must be completed, not less than thirty-six of which must be taken in this institution.

Any transfer of credits from another institution to apply in partial fulfillment of the requirements for the master's degree must be recommended by the head of the major department and approved by the Graduate Committee.

III. MAJOR AND MINOR. The exact number of credits in major and minor fields 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. Designation of a minor field is advisable to avoid the narrow training so often criticized in graduate study. If the minor is taken in the major department, it must be in a distinct subdivision of that department.

A graduate student may not change from one major to another without written permission from the heads of both departments and the Dean of the Graduate College.

Credit in major work can be secured only by completion of courses chosen from the lists given in the graduate catalog headed "Open to Graduates Only, Major or Minor", and "Open to Graduates and Advanced Undergraduates, Major or Minor". Courses for minor credit may be chosen from either of the lists mentioned above, and if chosen in a department other than the major, from the list headed "Open to Graduates for Minor Only". Other courses may be taken as supporting work but will not be credited toward an advanced degree.

IV. MODERN LANGUAGES. Except when specifically waived in the description of requirements of the student's major department in this catalog, a satisfactory reading
knowledge of French, German or Russian must be certified by the Examiner in Modern Languages prior to admission to candidacy. In special cases, upon recommendation of the head of the department in which the major work is taken and approval of the Graduate Committee, some other foreign language of particular value to the work of the candidate may be substituted.

Students who are unable at the time of their admission to meet the foreign language requirement in the department in which the major work is taken should not expect to complete the work for the degree of Master of Science in the minimum length of time.

V. Qualification for Candidacy. A student may be eligible for candidacy after completing one quarter's work with a "B" average.

VI. Application for Admission to Candidacy. Form VI, requesting admission to candidacy, may be secured from the office of the dean. This application must be approved and signed by the head of the department in which the major subject is offered and by the person in charge of the major, and must include certification that all modern language and English requirements have been met.

This form must be filed in the office of the Dean of the Graduate College by midterm of the quarter before the student expects to take the degree.

VII. Approval of Candidacy. When the Graduate Committee has approved the application for admission to candidacy, Form VII is sent to the department head (copy to student) giving the exact thesis title as approved and providing space for requesting the final examination. This form should be filled out, signed by the department head, and returned to the office of the Dean of the Graduate College at least four weeks before the date of examination.

VIII. Diploma Slip. A diploma slip (obtained at the office of the Dean of the Graduate College) must be filled out and returned with Form VI to the Graduate Office by midterm of the quarter before the student expects to take the degree.

IX. Examination. To schedule the final examination, Form VII is completed by the major professor, approved by the department head, and returned to the office of the Dean at least four weeks before the date of examination. The final examination shall be taken on all graduate work, including the thesis. Ordinarily it will be oral, but may be written in whole or in part, as determined by the committee in charge. The purpose of this examination is to determine the candidate's general fitness and preparation. It shall be held at such time and place as are recommended by the above procedure, and shall be completed at least two weeks prior to the close of the quarter in which the degree is to be granted.

The report of the examination, Form XVI, should be signed by all members of the committee and forwarded promptly to the Dean of the Graduate College.

X. Thesis. Presentation of a thesis is required by all departments. Joint theses are not acceptable. Copies of the completed thesis must be in the hands of the examining committee and the Librarian for approval one week prior to the date fixed for the final examination. After the final examination two complete and approved typewritten copies of the thesis shall be deposited with the Librarian for binding. These copies of the thesis must be deposited not less than one week prior to commencement. A charge of $10 will be made to cover library costs and title publication in the Iowa State College Journal of Science.

The student should consult the Thesis Manual, prepared for the use of students in the Graduate College, before arranging for the typing of his thesis.

Requirements for the Degrees of Master of Engineering, Master of Landscape Architecture and Master of Vocational Education

Admission to candidacy and other procedures for the professional degrees are the same as stated above for the degree of Master of Science. The following departures from the requirements for that degree are authorized.

For the Degree of Master of Engineering, residence requirements may be reduced to 18 weeks if off-campus classes are authorized at locations with adequate library, laboratory and other facilities. A reading knowledge of one modern language and a minimum of 45 credits, including thesis, will be required.
For the Degree of Master of Landscape Architecture, one full year of successful professional practice will be required in addition to a thesis.

For the Degree of Master of Vocational Education, a minimum of 57 credits will be required, at least 27 of which must be in fields other than education. Under certain conditions, the Graduate Committee may authorize acceptance of not more than 12 credits of non-graduate course work basic to the candidate's teaching field as part of the 27 credits. Modern language requirements may be waived and a special report written in lieu of a thesis.

Requirements for the Degree of Doctor of Philosophy

The primary requirements for the degree of Doctor of Philosophy are three: (1) High attainment and proficiency of the candidate in his chosen field, (2) development of a thesis which shall be a real contribution to knowledge and which shall show power of 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 his preparation in related and minor courses.

Upon admission of the graduate student to work looking toward the degree of Doctor of Philosophy, the department head shall recommend to the Dean of the Graduate College a committee of the Graduate Faculty to be in charge of his work. This committee shall consist of the following: The faculty member who will be in charge of the major research (chairman), representatives of the departments in which major and minor work are to be taken, and such other representatives of the Graduate Faculty as may be appointed by the dean. This committee shall file with the Dean of the Graduate College, at least two quarters in advance of the preliminary examination, an outline (Form X) of the graduate program to be pursued by the student.

The degree of Doctor of Philosophy may be conferred upon candidates who have met the following requirements:

I. Residence. A minimum of three years shall be spent in full-time graduate study, at least one-half of which is to be in residence at Iowa State College. At least three quarters of resident study must be during the academic year. To satisfy any one-year residence requirement at least thirty-six credits must be earned. Any transfer of graduate credit from another institution must be recommended by the student's committee and approved by the Graduation Committee. A transfer involving a master's degree granted elsewhere requires the approval of the master's thesis as a thesis of distinction by the student's committee. Transfer of other graduate credit should be approved only if it is of "B" grade or better.

The degree will be conferred not solely as a result of faithful study over any period, but for research work of a scholarly character, and successful passing of all examinations.

II. Major and Minor Work. Major work shall be taken in one department or subdivision of a department, or in exceptional cases in two closely related departments. A first and a second minor shall be chosen, one of which shall be taken in a separate department from that in which the major is taken.

Credit in major work can be secured only by the completion of courses chosen from the lists headed "Open to Graduates Only, Major or Minor" and "Open to Graduates and Advanced Undergraduates, Major or Minor." During the last two years of the graduate work the courses selected generally should be from the list headed "Open to Graduates Only, Major or Minor." Courses for which minor credit is allowed may be selected from either of the lists mentioned above and from the list headed "Open to Graduates for Minor Only." Supporting courses not allowed for graduate credit are frequently advisable.

III. Modern Languages. A satisfactory reading knowledge of French, German or Russian must be certified by the Examiner in Modern Languages before application is made for preliminary examination. In special cases, upon recommendation of the student's committee and approval of the Graduate Committee, another language, of direct value to the candidate's research field may be substituted.

IV. Preliminary Examination and Advancement to Candidacy. The student admitted with less than a "B" average will be required to maintain a "B" average for two quarters in residence at Iowa State College before becoming eligible to candidacy for
the degree. The student must pass satisfactorily a preliminary examination before ad-
mission to candidacy for the degree. It must be passed at least three quarters before the
final examination. Exceptions to this rule will be made only upon special recommendation
of the student's committee and approval of the Graduate Committee. In no case may
the final examination be given in less than six months from the time of the preliminary
examination. The dates and places for this examination will be fixed by the dean upon
recommendation of the committee in charge.

The preliminary examination for the doctorate will not be scheduled in the second term
of the Summer Quarter. Exceptions to this rule will be made only in case the chairman,
the professor in charge of each of the minors, and at least one other member of the
candidate's regular committee, signify in writing that they will be in residence and will
be present for the examination. Substitutes for other members may be designated.

V. THESIS. A doctoral dissertation (thesis) shall be completed on some topic connected
with the major subject. To be acceptable it must constitute a real contribution to knowl-
dge. Joint authorship is not permitted.

Copies of the completed thesis must be in the hands of the examining committee and
the Librarian for approval three weeks prior to the date fixed for the final examination.
After the examination, and at least two weeks prior to commencement, two complete
and approved typewritten copies of the thesis shall be deposited with the Librarian for
binding.

At the same time the thesis is deposited, two typewritten copies of an abstract which
meets the requirements as set forth in the Thesis Manual must also be filed with the Li-
brarian. A charge of $30 will be made to cover library costs, microfilming of the dis-
sertation and publication of a 600-word abstract in Dissertation Abstracts. An additional
charge will be made for abstracts which exceed 600 words. The abstract should cover
the entire thesis and should not be considered as excluding publication of a journal article
which normally would be confined to but a portion of the research.

VI. EXAMINATION. A final examination shall be taken on all graduate work including
thesis. This examination shall be conducted by the student's committee with such other
members of the faculty as may be designated by the Dean of the Graduate College. It
will be written or oral, or both, as determined by the committee.

The final examination for the doctorate will not be scheduled in the second term of
the Summer Quarter. Exception to this rule will be made only in case the major professor,
the professor in charge of each of the minors, and at least one other member of the
candidate's regular committee, signify in writing that they will be in residence and will
be present for the examination. Substitutes for other members may be designated.

The committee will certify to the Dean of the Graduate College the results of the ex-
amination (Form XVI).

VII. DIPLOMA SLIP. A diploma slip (obtained at the office of the Dean of the Graduate
College) must be filled out and returned by midterm of the quarter before the student
expects to take the degree.

Departments of Graduate Instruction

For complete information concerning the graduate offerings of each department and the
subfields in which graduate students may major or minor in each department, see the
announcement of "Opportunities for Graduate Study" in the departmental course de-
scriptions in this catalog (see page 112) or write for the Announcement of the Graduate
College.
Collegiate Instruction

Definition of a Credit. The value of each course is stated in quarter credits. A one-credit course requires one recitation involving two hours of preparation, or one three-hour laboratory period, or other combination of teacher-student contact and outside preparation involving a total of three clock hours per week for twelve weeks.

Course Numbers. In each department the courses, for convenience of reference, are given in numerical order. The courses are divided into groups as follows:

- 1-99—Courses for noncollegiate students.
- 100-299—Courses primarily for freshman and sophomore students.
- 300-499—Courses primarily for junior and senior students.
- 500-509—Courses for advanced undergraduate students and graduate students for major or minor credit.
- 600-699—Courses for graduate students for major or minor credit.

After the title of each course are two numbers in parentheses. The first indicates the number of lectures and recitations a week and the second the number of hours of laboratory a week. For example, a course title followed by (1-3) is a course with one lecture or one recitation and three hours of laboratory a week.

At the end of the first line of each course description will be found one of the following letters: F. W. S. SS., indicating which of the four quarters—fall, winter, spring, summer session—of the college year the course is offered. Alt. is the abbreviation for alternate. The abbreviation Yr. is used to designate a sequence of three courses taught fall, winter and spring, respectively. If there is sufficient demand, courses may be offered more frequently than announced.

Aeronautical Engineering

Ernest Willard Anderson, Ph.D., Head of Department

Associate Professor: Merlin L. Millett, Jr., Ph.D.
Assistant Professor: Frederick W. Stuve, M.S.
Instructors: Merl R. Core, B.S.; James D. Iversen, B.S.; Lawrence H. Stein, B.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in aeronautical engineering leading to the degree of Bachelor of Science, see page 67.

The curriculum in aeronautical engineering is designed to provide the student with basic training in the scientific principles pertaining to aircraft structure, aerodynamics and aircraft propulsion. To the graduate in aeronautical engineering the field offers a wide variety of opportunities ranging from research and development, design and production to sales and management.

Ground and flight instruction for pilot training are given on the campus and at the municipal airport through local flight operators.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in aeronautical engineering; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in aeronautical engineering at this institution.

Open to graduate students for minor only: 360, 380, 410, 411, 412, 415, 420, 440, 470.
Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Required. S. Orientation in the field of Aeronautical Engineering.

212. Pilot Training Ground Instruction. (3-0) Cr. 3. W.
Instruction in meteorology, navigation, and Civil Air Regulations to meet the requirements for the Civil Aeronautics Administration certificate of competency.

214. Advanced Pilot Training Ground Instruction. (4-0) Cr. 3. S.
Prerequisite: 212.
Aircraft (aerodynamics and structures) instruments, parachutes, navigation, power plants (engines, propellers, and accessories) from the operational viewpoint of the airplane pilot.

216. Pilot Training Flight Instruction I. (3-0) Cr. 1. F.W.S.
Prerequisite: Credit or classification in 212. Ten hours dual flight instruction (or the equivalent in combined dual and solo time) in conventional or unconventional aircraft in preparation for solo flight.

218. 219. 220. Pilot Training Flight Instruction II. (3-0) Cr. 1 each. F.W.S. Each.
Prerequisite: 216 credit or classification in 214. Ten hours dual flight instruction per course (or the equivalent in combined dual and solo time) in conventional or unconventional aircraft in preparation for the Civil Aeronautics Administration Private Pilot Certificate. A pro rata refund of the fee will be made if the student is required by the college to discontinue training.

241. General Aeronautics. (2-0) Cr. 2. F.
Prerequisite: Credit or classification in Phys. 221. Aeronautical history and nomenclature; theory of flight, properties of the atmosphere.

242. Aircraft Materials and Construction. (3-0) Cr. 3. W.
Prerequisite: 241, Chem. 103. Properties of materials used in aircraft; fabrication techniques; objectives of design.

243. Aircraft Instruments. (2-0) Cr. 2. S.
Prerequisite: 242 and credit or classification in Phys. 223. Principles underlying operation of flight, navigation, engine and miscellaneous instruments. Instrument errors. Flight control.

301. Aeronautical Problems. (3-0) Cr. 3. F.
Prerequisite: Math 213. Problems which develop basic ideas in aeronautics and at the same time emphasize mathematical and physical concepts and computer organization.

310. Aerodynamics I. (3-3) Cr. 4. S.
Prerequisite: 301. Corequisite: T.&A.M. 324. Properties of air and the atmosphere; stream functions; theory of lift of infinite and finite wings; nature of drag.

360. Aerodynamics II. (3-3) Cr. 4. F.
Prerequisite: 310. Performance of aircraft.

370. Aircraft Materials and Processes. (2-6) Cr. 4. W.
Prerequisite: T.&A.M. 324. Materials, fabricating techniques, and design procedures used in aircraft manufacture.

380. Stress Analysis I. (3-0) Cr. 3. S.
Prerequisite: T.&A.M. 324. Distribution of loads to the airplane structure. Analysis of elementary structures.

400. Inspection Trip. Required. F.
Prerequisite: Senior Aero.E. classification.
Inspection trip to aeronautical concerns and activities.

409. Reaction Propulsion A. (3-0) Cr. 3. F.
Prerequisite: M.E. 322 or 344. Reciprocating engine-propeller, turbojet, turboprop propulsion systems for aircraft. Altitude performance of engine and airframe.

410. Stability and Control. (4-0) Cr. 4. W.
Prerequisite: 360. Stability and control of airplane for zero angular acceleration.

411. Reaction Propulsion B. (3-0) Cr. 3. W.
Prerequisite: M.E. 322 or 344. Pulse jet, ramjet and rocket propulsion systems. Diffusers, jet nozzles. Altitude performance.

412. High Speed Aerodynamics. (3-0) Cr. 3. S.
Prerequisite: 360, M.E. 322 or M.E. 344. Principles of compressible fluid flow, compression shock and expansion waves. Application to wind tunnel, airfoil and solid of revolution flow problems.

415. Advanced Stability and Control. (3 to 5-0) Cr. 3 to 5. F.W.S.
Prerequisite: 410. Stability and control involving angular accelerations.

420. Stress Analysis II. (3-3) Cr. 4. F.
Prerequisite: 360. Analysis of compression panels, webs in shear, statically indeterminate structures.

422. Stability of Aircraft Structures. (3-3) Cr. 4. W.
Prerequisite: 420. Buckling theory, permanent deformations and allowable loads on thin metal structures.

440. Flight Testing. (2-6) Cr. 4. S.

461. Airplane Design. (1-6) Cr. 3. F.
Prerequisite: Credit or classification in 360 and 420. Preliminary design of an airplane and its components.

462. 488. Airplane Design. (2-6) Cr. 4 each. W.S.
Prerequisite: 461 and credit or classification in 410. Preliminary design of an airplane and its components.

470. Aeronautical Problems. (As arranged) Cr. 3 to 6. F.W.S.

491. 492, 493. Aeronautical Seminar. (1-0) Required. Yr.
Courses for Advanced Undergraduate and Graduate Students

510, 511 Aerelasticity (3-0) Cr. 3 each. 
Alt. W.S., Offered 1956. Mr. Anderson  
Prerequisite: T.3.A.M. 444 or equivalent.  
Interaction of aerodynamic, elastic, and  
twist of influence of this  
reaction on airplane design. Steady and  
unsteady aerelastic problems.

520, 521 Missile Theory (3-0) Cr. 3 each. 
Prerequisite: 410 or permission of in-  
structor. Mr. Anderson.  
Aerodynamics, propulsion and guidance  
of missiles.

541, 542, 543. Advanced Aerodynamics.  
(3-0) Cr. 3 each. Yr. Mr. Anderson.  
Prerequisite: 410.  
Classical flow theory, compressible fluid  
theories, and shock wave studies.

Courses for Graduate Students

620. Seminar. (1-0) Cr. 1. Mr. Anderson.  

AGRICULTURAL BUSINESS

For description of courses, see Department of Economics and Sociology, courses in economics, page 157.

AGRICULTURAL EDUCATION

For description of courses, see Department of Vocational Education, page 241.

AGRICULTURAL ENGINEERING

Robert Beresford, A.E., Head of Department

Professors: Quincy C. Ayres, C.E.; Kenneth K. Barnes, Ph.D.; Edgar V. Collins, B.S.;  
Norval H. Curry, M.S.; Richard K. Frevert, Ph.D.; Henry Giese, Arch.E.; William V.  

Associate Professors: Fred W. Roth, M.S.; Norval J. Wardle, Ph.D.

Assistant Professors: Willard R. Anderson, M.S.; Ray E. Armstrong, M.S.; Leon F.  
Charity, Ph.D.; Talam E. Hazen, Ph.D.; Donnell R. Hunt, M.S.; John H. Pedersen,  
Ph.D.; Paul N. Stevenson, M.S.; Ted L. Willrich, M.S.

Instructors: Gordon E. Barlow, Jr., B.S.; Craig E. Beer, M.S.; Ben L. Grover, M.S.;  
Jerald M. Henderson, B.S.; Howard P. Johnson, M.S.; Albert C. Lewis, B.S.; David A.  
Link, B.S.; Robert A. Norton, B.S.; David B. Palmer, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in agricultural engineering leading to the degree of  
Bachelor of Science, see page 68.

The curriculum in agricultural engineering provides training in the major fields of en-  
gineering applications to the industry of agriculture. Graduates from the curriculum find  
employment in agricultural production enterprises, in the industries which supply goods  
and services to agriculture, and in the State and Federal agencies responsible for agricul-  
tural engineering research, application and education.

Employment in the farm machinery industry in engineering design, development, manu-  
factoring, product education, and sales is available to those students majoring in the power  
and machinery option. Farm structures majors find employment with the industries sup-  
plying farm building materials and equipment and in the design, construction, merchandis-  
ing, and contracting of farm buildings. Students may also 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; and materials  
handling in agriculture.

The department has cooperative programs established, for interested and qualified stu-  
dents, with certain companies in the farm machinery industry. The four-year curriculum  
is extended over a five-year period and interspersed with work periods in a farm ma-
chinery manufacturing plant. This plan offers valuable practical experience and financial assistance during the years in college.

In addition to the courses for students majoring in agricultural engineering, the department offers a number of courses for students from the Division of Agriculture. These include courses in farm mechanics, soil and water conservation, farm power and machinery, farm electrification, farm structures, and crop storage and conditioning.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in soil and water conservation, agricultural machines, agricultural power, rural electrification, and agricultural structures; and minor work to students taking major work in other departments. Work may be taken for the degree of Doctor of Philosophy as a divided major with departments offering work in related fields for this degree.

Prerequisite to major graduate work is the completion of an undergraduate curriculum in agricultural engineering substantially equivalent to that required of undergraduate students at this institution.

Minor work in agricultural engineering is offered for students in other departments and minor work in agricultural mechanics is offered for students in agriculture.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only in agricultural engineering; 346, 425, 427, 436, 447, 476. Open to graduate students for minor only in agricultural mechanics: 345, 415, 489, 496.

Courses Primarily for Undergraduate Students

109. Technical Lecture. (1-0) Required. S. The field of agricultural engineering, its relation to the agricultural industry and to the engineering profession.

157. Dairy Machinery. (0-6) Or. 2. E. For dairy equipment and food industries students. Sanitary and common pipe fitting, soldering and sheet metal, oxy-acetylene and arc welding, silver soldering, electric, and service and repair of dairy equipment.


236. Agricultural Machines. (2-8) Or. 3. F. Prerequisite: Credit or classification in Phys. 221. Development, economic requirements, construction, efficiency, capacity, cost of use, testing and selection of agricultural machines.

254. Farm Machines. (0-6) Or. 2. F.W.S. Use of hand and machine tools, forge and welding work, soldering and sheet metal, farm electricity, arc and oxy-acetylene welding, repair of farm machinery.

255. Farm Carpentry. (0-6) Or. 2. F.W.S. Selection, use and care of hand and power carpentry tools. Selection of building materials, construction of farm buildings and farm equipment.


259. Farm Buildings and Equipment. (2-3) Or. 3. W. Functional requirements of farm buildings. Planning farm buildings with special regard to livestock housing and grain storage requirements, economy, convenience, sanitation, appearance, material selection and structural adequacy.


306. Soil and Water Conservation. (2-8) Or. 3. F.S. Engineering aspects of soil and water conservation for students in agriculture. Use of the level, land description, design, location and construction of erosion control and drainage facilities. Field trips to problem areas.

384. Farm Machinery and Power Management. (3-8) Or. 4. F.W.S. Prerequisite: Math. 100, Phys. 204. Mechanics and materials of farm machinery construction. Adjustment, selection, capacity and cost of use of farm machinery. Transmission, measurement, and cost of use of farm power.

346. **Agricultural Tractor Power.** (3-3) Cr. 4. S.  
Prerequisite: M.E. 344.  
Kinematics and dynamics of tractor power application; draw bar, power take-off, and traction mechanisms. Thermodynamic principles and construction of the internal combustion engine, fuels and carburetion, ignition. Rating and testing of tractors.

354. **Advanced Farm Mechanics.**  
(1-6) Cr. 3. P.W.S.  
Prerequisite: 254.  
Art and oxy-acetylene welding and cutting, farm machinery repair, farm electricity, and farm plumbing.

359. **Machine Construction.**  
(0-6) Cr. 2. F.W.S.  
Prerequisite: Chem. 103 or equivalent; Agricultural Engineering or Industrial Education classification.  
Oxy-acetylene and electric welding, Chemical and metallurgical principles. Selection of equipment. Methods of constructing experimental and production machines.

362. **Agricultural Applications of Electrical Energy.** (2-3) Cr. 3. F.  
Prerequisite: Phys. 223.  
Practical application of electric energy to the farm and farm home; selection, operation, maintenance, and economies of electrical equipment.

364. **Farm Electricity.** (1-3) Cr. 2. W.S.  
Prerequisite: 254, Phys. 204.  
Use of electricity in productive farm enterprises and in the improvement of farm living; costs, quality of products, savings in labor; wiring the farm for work simplification, for safeguarding health and for recreation; servicing motors and electrical appliances.

374. **Concrete and Masonry.** (1-3) Cr. 2. P.S.  
Materials, specifications and tests; mixtures, forms, reinforcements, uses of concrete on the farm. Other fireproof building materials.

400. **Inspection Trip.** Required. F.  
Prerequisite: Senior A.E. classification.  
Observe a farm trip to centers of industry and engineering construction.

401. **402, 408. Seminar.** (1-0) Required. Yr.  
Preparation, presentation and discussion of papers on agricultural engineering subjects.

410. **Farm Safety.** (1-0) Cr. 1. F.S.  
Prerequisite: Senior classification.  
Preparation, presentation and discussion of papers on farm safety subjects; methods of safety education; safety programs.

415. **Teaching Farm Mechanics.**  
(V.Ed. 415) (2-3) Cr. 3. F.W.S.  
Prerequisite: 254 or permission of instructor.  
Objectives and methods; equipment and management of the shop; organization of shop program. Students will plan and present demonstrations of methods of teaching mechanical skills.

425. **Soil and Water Conservation Engineering.** (2-6) Cr. 4. F.  
Prerequisite: 224, T.A.A.M. 278.  

427. **Irrigation.** (3-0) Cr. 3. W.  
Prerequisite: 425.  

428. **Special Problems.** Cr. 1 to 5. F.W.S.

429. **Design of Soil and Water Conservation Facilities.** (2-3) Cr. 3. W.  
Prerequisite: 425, C.E. 360.  

436. **Agricultural Machinry Design.** (2-6) Cr. 4. W.  
Prerequisite: 236, M.E. 315.  
Design, development and testing of farm machinery to meet the functional requirements of machines for tillage, seeding, cultivation and weed control, harvesting, crop processing, and farm power units.

447. **Agricultural Engineering Applications.** (3-0) Cr. 6.  
Prerequisite: 236, 346, T.A.A.M. 324.  
Summarization, correlation and extension of the agricultural engineering techniques. Economic limitations in design and management.

461. **Applications of Electrical Principles to Agricultural Equipment.** (2-6) Cr. 4. W.  
Prerequisite: Credit or classification in E.E. 437.  
Selection and use of electrical equipment as related to efficiency and economy of agricultural production, processing and storage of feeds, forage crops and grains in connection with the livestock poultry and dairy enterprises.

463. **Farm Electrification Design.**  
(3-3) Cr. 4. S.  
Prerequisite: A.E. 461.  
Engineering problems in the design of electric distribution systems. Design of control circuits and equipment used in livestock, grain, and forage production.

475. **Agricultural Structures.**  
(3-3) Cr. 4. F.  
Prerequisite: A.E. 217, C.E. 335 or M.E. 312.  
Structural problems in agricultural buildings. Valuation, appraisal and estimating. Design of major service and processing buildings.

487. **Advanced Agricultural Structures Design.** (3-9) Cr. 4. W.  
Prerequisite: 259, T.A.A.M. 324.  
Wind loads and wind resistant construction. Structural problems in farm buildings. Valuation, appraisal and estimating. Design of major service and processing buildings.

488. **Environmental Control in Agricultural Structures.** (3-3) Cr. 3. S.  
Prerequisite: 475, M.E. 344.  
Analysis of psychrometric data; calculation of heat losses. Design of residential heating plants. Heat and moist-
ture production of animals and stored crops. Design of insulation, ventilation, heating and cooling systems for animal shelters. Design of crop driers.

489. Farm Buildings and Equipment. (2-3) Cr. 3. F.W.
Prerequisite: Phys. 204. Senior Classification.

491, 492, 493. Dairy Plant Equipment. (D.P.I. 491, 492, 493) (3-3) Cr. 4 each Yr.
Design, construction and functioning of dairy plant equipment.

Prerequisite: 306 or equivalent.
Primarily for graduate students in agriculture. Mechanical methods of controlling erosion and providing drainage. Flood control. Irrigation methods. Land measurement. Use of aerial photographs. Field trips to problem areas.

Course for Advanced Undergraduate and Graduate Students
528. Special Topics. Cr. 1 to 5. F.W.S.
Messrs. Ayres, Barnes, Beresford, Col-
lins, Frevert, Giese, Morford.

Courses for Graduate Students
628. Research. F.W.S.
Messrs. Ayres, Barnes, Beresford, Col-
lins, Frevert, Giese, Hukill.

631. Agricultural Structures and Equipment Engineering. (3-0) Cr. 3. F.W.
Prerequisite: Graduate classification in engineering. Mr. Giese.
Critical analysis of the design and functional relation of farm structures and equipment, including research methods, project planning, and reporting of results.

632. Advanced Soil and Water Conservation Engineering. (3-0) Cr. 3. W.
Prerequisite: Graduate classification in engineering. Messrs. Barnes, Beresford, Frevert.
Critical analysis of the design and functional relations of soil and water con-
servation facilities, including experimental techniques.

633. Agricultural Power and Machinery. (3-0) Cr. 3. S.
Prerequisite: Graduate classification in engineering. Messrs. Barnes, Beresford, Collins.
Critical analysis of power and equipment for agricultural production with emphasis on functional design requirements, and techniques for testing and evaluating performance.

661, 662, 663. Seminar. (1-0) Cr. 1 each. F.W.S.
Discussion of research problems, methods, procedures, and reports. Mr. Beresford.

AGRICULTURAL JOURNALISM

For description of courses, see Department of Technical Journalism, page 227.

AGRICULTURE

FLOYD ANDRE, Ph.D., Dean of Agriculture
ROY M. KOTTMAN, Ph.D., Associate Dean

PROFESSORS: Louis M. Thompson, Ph.D.; Russell M. Vifquain, M.S.
ASSISTANT PROFESSOR: Robert M. Collins, Ph.D.
INSTRUCTORS: Jack M. Alexander, M.S.; Thomas D. Hinesly, M.S.

Opportunities for Undergraduate Study

For undergraduate curricula in agriculture, see pages 37 to 60.
For preparation for graduate study, see page 59.
For training for extension service, see page 58.
For training in foreign trade and service, see page 59.

Farm Operation

LOUIS M. THOMPSON, Ph.D., In Charge

For undergraduate curriculum in farm operation leading to the degree of Bachelor of Science, see page 49.

The curriculum in farm operation is intended for those students who are looking forward to general farming as their lifework. It is, therefore, designed to develop those understandings, abilities, and attitudes which are essential to (a) efficient farm operation and management, (b) effective participation as a citizen and leader in a rural community, and (c) personal satisfaction and happiness in rural living.
The farm operation curriculum includes a collegiate winter-quarter program, a two-year program leading to a certificate and a four-year program leading to a Bachelor of Science degree in Agriculture. The first two years of the four-year program are identical to the two-year program which leads to a certificate.

Practical Work Required by all Departments

Administered by the head of the department in which the student elects to take the work.

Students in the Division of Agriculture must have at least six months of practical experience before graduation. This requirement should be met before the beginning of the junior year. (See Ag. 104.)

Administered by the Division of Agriculture

Courses Primarily for Undergraduate Students

101. Orientation. Required. W.
Lectures and class work designed to aid the first-year student to adjust himself to his college environment, and to acquaint him with the areas of work for which education is provided in the Division of Agriculture.

104. Practical Work.
A minimum of six months practical work in the student's field of study is required for graduation. This requirement should be met before the beginning of the junior year.

105. Basic Principles of Agriculture.
Or. 1 to 4. W. For Special Groups.

Soil management; crop production; livestock production; farm machinery; farm management; agricultural leadership.

110. Technical Lecture.
(1-0) Required. F.W.
Survey of opportunities in agriculture.

450. Farm Operation (8-4) Or. 4. F.W.S.
Prerequisite: Junior classification in Division of Agriculture.
Participation in the management and operation of an Iowa farm. The class is responsible for the plans, records and decisions of buying and selling of livestock, crops and equipment. Trips to farms and markets.

AGRONOMY

WILLIAM H. PIERRE, Ph.D., Head of Department


*On leave.
Opportunities for Undergraduate Study

For undergraduate curriculum in agronomy leading to the degree of Bachelor of Science, see page 43.

The curriculum in agronomy has as its objective training in agriculture with emphasis on the basic principles of crops and soils. Supporting and elective courses are taken in related fields to broaden the student’s knowledge in the entire field of agriculture.

Opportunity is provided to meet the diverse interests of students in agronomy through selection of a broad course of training in either the soils and crop production option or the agronomic science option or one of several specialized outlines of study. For those students who wish to continue their training in post-graduate study, a special program is outlined to provide additional course work in the sciences basic to Farm Crops, Soils or Agro-Climatology. Individually planned programs may be prepared to meet the specific needs of the student.

Graduates in the general course in agronomy are trained to fill positions as county extension directors, farm managers, government workers, instructors in agricultural colleges and agronomists with commercial organizations. Graduates with specialized training in each of the fields of study listed on page 45 may secure positions in their respective fields of specialization. For example, in the field of commercial seed production or seed technology the suggested electives should prepare the student for positions with hybrid seed corn companies and other commercial seed firms or for positions as grain inspectors. Training in the special program for soil conservation has been outlined to prepare students for positions in soil conservation. The course of study in soil survey and land appraisal is designed for students who seek positions with state or federal agencies as soil surveyors and with service companies, loaning and other agencies interested in land appraisal.

Graduates from the specialized program for continuation study on the post-graduate level should continue their training to the completion of the master’s or doctor’s degree. Advanced training will be preparation for positions in research in the several specialized fields of agronomy in state or federal experiment stations, in industry and as specialists in these fields in colleges and universities.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy with specialization in crop production, crop breeding, soil physics, soil fertility, soil microbiology, soil morphology and genesis, soil management, and agricultural climatology; and minor work to students taking major work in other departments.

Prerequisite to major graduate work in farm crops or soils is the completion of an undergraduate curriculum substantially equivalent to that recommended for pre-graduate training in the agronomy curriculum at this institution. See page 45. The completion of the prerequisite listed on page 151 is necessary for major graduate work in agricultural climatology.

Open to graduate students for minor only: 414, 415, 424, 434, 453, 454, 455, 464, 473, 485.

Courses in General Agronomy

Courses Primarily for Undergraduate Students


300. Crop Production and Soil Management. (6-0) Or. 5. SS. For special groups.
Distribution, production, harvesting and utilization of crops; formation, characteristics and classification of soils; principles and practices of soil conservation, fertility maintenance and soil management.

400. Agricultural Travel Course.
Or. 4. Students taking this course will be required to register for A.H. 400 for 4 credits. SS. Prerequisite: Junior classification and/or permission of instructor.
Tour and study of production methods in major crop and livestock regions of the United States. Influence of climate, soil, topography, markets, and other factors on livestock and crop production and livestock management practices.
Courses in Agricultural Climatology

Courses for Undergraduate and Graduate Students

505. Plant Climate. (3-0) Cr. 3. S.
Prerequisite: 154, Phys. 204, Bot. 205. Mr. Shaw.
The heat exchange near the ground. Relation of topography and plant cover to the micro-climate. Modification of micro-climate by agricultural operations.

Courses for Advanced Undergraduate and Graduate Students

506. Methods in Climatology. (3-0) Cr. 3. S. Not Offered 1959.
Prerequisite: 505, Stat. 448. Mr. Shaw.
Physical and statistical processes in the study of the climate and the analysis of agro-climatic data.

Courses for Graduate Students

606. Research in Agro-Climatology. F.W.S. Mr. Shaw.
Consultation with instructor, exhaustive examination of the literature pertaining to and original thought on a special research problem of special interest to the student.

Courses in Farm Crops

Courses for Undergraduate Students

114. Principles of Crop Production. (3-0) Cr. 3. F.W.S.
Introductory principles of crop production; adaptation, culture and utilization of important field crops.

214. Grain Crops. (3-2) Cr. 4. F.W.S. Mr. Shaw.
Cr. 3. S. W.
Corn, soybeans and small-grain crops, including their distribution, improvement, harvesting, marketing and utilization. Identification of crop varieties and important weed seed. Study of seed quality.

234. Forage Crops. (3-2 or 0) Cr. 4 or 3. F.W.S. Mr. Shaw.
Cr. 3. S.
Study of grasses, legumes, and other plants and their uses as hay, pasture, silage, sowing, and green manure.

311. Seminar. (1-0) Cr. 1. F.W. Mr. Shaw.
Cr. 3. S. W.
Current farm problems. Interpretation of research data.

317. Commercial Crop Grading and Identification. (Ec. 317) (1-4) Cr. 3. S. F.
Prerequisites: 214 or 114 and Ec. 100.
Grading and identification of cereal and forage crops with particular emphasis on market classes and grades.

411. Seminar. (1-0) Cr. 1. F.W. Mr. Shaw.
Cr. 2 to 4.
Application of practical crop problems according to needs and interests of students.

Courses for Advanced Undergraduate and Graduate Students

514. Crop Adaptation. (3-0) Cr. 3. F.
Prerequisites: 214, Gen. 300 or permission of instructor. Mr. Willis.
Principles of plant distribution; genetic concepts of adaptation; importance of natural selection. Environmental factors and geographic distribution of crops; the human factor.

515. Advanced Crop Management. (3-0) Cr. 3. S.
Prerequisite: 414, 555, or permission of instructor.
Advanced study of theories and practices underlying crop management.

524. Principles of Crop Breeding II. (3-0) Cr. 3. W. Mr. Kalton.
Prerequisite: 424, Bot. 407.
Application of genetic principles to improvement of important farm crops.

525. Crop Breeding Techniques. (3-2) Cr. 3. S.
Prerequisites: 424 and permission of instructor, Mr. Kalton.
Field and laboratory methods and practices in plant breeding.

545. Special Topics in Farm Crops. Cr. 2 to 4. F.W.S.
Prerequisites: Quality point average of 2.5 in preceding two quarters and sufficient preparation to benefit from specialized study. Messrs. Johnson, Kalton.
Literature reviews and conferences on selected topics according to needs and interests of students.
Courses for Graduate Students

621. Advanced Cereal and Forage Crop Breeding. (3-0) Cr. 3. W.  
Prerequisite: 524, Gen. 630. Mr. Johnson.  
Basic principles of inbreeding, hybridization, selection, and progeny-testing; breeding systems and plans.

622. Advanced Corn Breeding.  
(3-0) Cr. 3. W.  
Prerequisite: 524, Gen. 630. Mr. Sprague.  
Corn improvement; basic concepts of inbreeding and selection, testing for combining ability and utilization of inbred lines in the production of corn hybrids.

(3-0) Cr. 3. S.  
Mr. Johnson.  
Organizational and integration of research projects. Application of statistical methods in breeding experiments, breeding systems and plans.

553. Soil-Plant Relationships.  
(3-0) Cr. 3. W.  
Prerequisite: 554. Mr. Black.  
Composition and properties of soils in relation to the nutrition and growth of plants.

554. Laboratory Methods of Soil Investigations.  
(4 to 6) Cr. 2 to 8.  
A. Laboratory: 485, 585 or permission of instructor. Alt S. Not offered 1958.  
B. Soil Fertility, Prerequisite: 354,  Chem. 212. F.  
C. Soil Physics, Prerequisite: 577. W.  
Mr. Kirkham  
Processes of formation, systems of classification, and geographical distribution of soils.

557. Soil Chemistry (Chem. 557) (2-0) Cr. 2.  
Alt. S. Not offered 1958.  
Prerequisite: 553, Chem. 484 or equivalent. Mr. Scott.  
Chemical and mineralogical properties of soil colloids. Ion exchange and soil reaction.

558. Soil-Plant Investigations.  
(3-0) Cr. 3. W.  
Prerequisite: 553, Geol. 875 or 202. Mr. Riecken.  
Soil-water relations in relation to growth of plants.

(1-0) Cr. 1. W.  
Prerequisite: 553, 554, 577. W.  
Mr. Kirkham.  
Relation of physical properties of soils to plant growth, conservation practices and land utilization. Particle-size distribu-
tion, soil structure, clay minerals, soil moisture, rheological properties and soil temperature.

585. Soil Bacteriology.
   (Bact. 585) (3-S) Cr. 3. S.
   Prerequisite: 485, Bact. 304A or permission of instructor.

Courses for Graduate Students

655. Advanced Soil Fertility.
   (Bact. 587) (3-S) Cr. 3. Alt. W. Offered 1959.
   Prerequisite: 555, Mr. Black.

675. Advanced Soil Genesis and Classification.
   (Bact. 665A) Cr. 2 to 4. F.W.S.
   Prerequisite: 555. Mr. Riecken.

677. Advanced Soil Physics.
   Prerequisite: 577, Mr. Kirkham.

685. Advanced Soil Bacteriology.
   (Bact. 685) (3-S) Cr. 3. Alt. S. Not offered 1958.
   Prerequisite: 555.

AIR SCIENCE

COLLEGIATE INSTRUCTION

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596. Special Topics in Soils.
   (Bact. 596A) Cr. 2 to 4. F.W.S.
   Prerequisite: 15 credits in agronomy and permission of instructor.

Courses for Graduate Students

655. Advanced Soil Fertility.
   (Bact. 587) (3-S) Cr. 3. Alt. W. Offered 1959.
   Prerequisite: 555, Mr. Black.

675. Advanced Soil Genesis and Classification.
   (Bact. 665A) Cr. 2 to 4. Alt. S. Offered 1958.
   Prerequisite: 577, Mr. Riecken.

677. Advanced Soil Physics.
   Prerequisite: 577, Math. 212, Mr. Riecken.

596. Special Topics in Soils.
   (Bact. 596A) Cr. 2 to 4. F.W.S.
   Prerequisite: 15 credits in agronomy and permission of instructor.

Instructor.


Literature reviews and conferences on selected topics according to needs and interests of student.

The mission of the Air Force ROTC is to develop in prospective college graduates the qualities essential to their progressive advancement to positions of increasing responsibility as commissioned officers, and to prepare them for immediate assignment to duty with the Air Force.
The specific objectives of the program are:

1. To develop by precept, example and student participation the attributes of character, personality, social awareness, communicating ability, and leadership which are indispensable to an Air Force officer or to any other executive.

2. To develop an interest in the Air Force and an understanding of its organization, missions, problems and techniques.

3. To arouse in the selected student the desire to become an officer of the Air Force, and to develop and stimulate a growing desire on his part to enter the Air Force flight training or technical training programs.

The Basic Course is offered for the first two years. This course is designed to acquaint the student with the Air Force's role in today's world.

In the two years of the Advanced Course, the student receives training in the type of thinking and executive outlook required of a junior Air Force officer with emphasis on preparing him along lines that will prove of long range value to him whether he returns to civil life or becomes a career member of the United States Air Force.

The student is furnished a complete uniform and books while enrolled in AFROTC. If he elects to continue in the Advanced Course, and is selected as a result of competition with all interested cadets who have completed the Basic Course, he also is paid an allowance of approximately $80 per quarter. The Advanced Course student also must attend a summer training period, normally of four weeks' duration, between his Junior and Senior years. The government pays for travel and provides housing and meals in addition to paying a salary of $78 per month during this training period.

The college requirements for the Basic Course may be waived for veterans with over one year's honorable service in the Armed Forces. Those veterans desiring the Advanced Program must enter the Basic Program with their contemporaries.

Additional information concerning Air Force ROTC may be obtained by writing the Professor of Air Science, Iowa State College.

Courses Primarily for Undergraduate Students

141, 142, 148. Air Science I.

(2 or 0) Cr. 1 each.

(141) Introduction to AFROTC and aviation; leadership laboratory—basic military training.

(142) Introduction to elements of aerial warfare: targets, weapons.

(148) Aircraft: bases; leadership laboratory—basic military training.

241, 242, 248. Air Science II.

(2 or 0) Cr. 1 each.

(241) Careers in the USAF; air operations; leadership laboratory—cadet noncommissioned officer training.

(242) Fundamentals of global geography; international tensions and security organizations.

(248) International tensions and security organizations; military instrument of national security; leadership laboratory—cadet noncommissioned officer training.

841, 842, 848. Air Science III.

(3 or 5-2 or 0) Cr. 8 each.

Prerequisite: 248 or 1 year's active service in the Armed Forces.

(841) Introduction to advanced AFROTC; the Air Force commander and his staff; creative problem-solving; the military justice system; leadership laboratory—noncommissioned officer training.

(842) Communicating in the Air Force; instructing in the Air Force; Air Force base functions.

(843) Weather; air navigation; briefing for summer training; leadership laboratory—noncommissioned officer training.

(844) Leadership and management seminar; leadership laboratory—cadet wing officer training.

(845) Military aspects of world political geography.

(846) Military aviation and evolution of modern warfare; moral responsibilities of an officer; briefing for commissioned service; leadership laboratory—cadet wing officer training.

ANIMAL HUSBANDRY

Leslie E. Johnson, Ph.D., Head of Department

ASSOCIATE PROFESSORS: Ralph M. Durham, Ph.D.; Edwin A. Kline, Ph.D.; Elvin L. Quaife, B.S.; Bruce R. Taylor, Ph.D.


Opportunities for Undergraduate Study

For undergraduate curricula in animal husbandry and dairy husbandry, leading to the degree of Bachelor of Science, see pages 45 and 46.

The curricula in animal husbandry and dairy husbandry provide general training in the field of agriculture with special emphasis on the production of livestock and livestock products. The curricula permit a liberal allowance of elective credits to be filled with courses selected by the student.

Students graduating from these curricula with their various options go into many lines of work some of which are: operators of general or specialized livestock or dairy farms; directors of extension work; extension associates in youth activities; fieldmen for farm management or insurance companies; management, buying, sales or supervisory positions with meat packing, produce, feed, dairy and farm equipment companies; positions in the teaching field and employment with various agencies of the United States Department of Agriculture. Opportunities in college teaching and research are available to graduates of these curricula, but usually require graduate training.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in breeding, nutrition, production and reproduction with emphasis on beef cattle, dairy cattle, sheep or swine. A Master of Science degree is also offered in meats. Major work for the degree of Doctor of Philosophy is offered in breeding, nutrition and reproduction with the opportunity to specialize in beef cattle, dairy cattle, sheep or swine. Minor work is offered to students taking major work in other departments.

For those wishing training in meats beyond a Master of Science degree, see Food Technology, page 171.

The fields of major work above will include courses listed in other departments when such courses are appropriate to the student's previous training, major interests, and thesis problem. Thus, those taking major work in all the above fields will often include courses in mathematics and statistics. Those taking major work in animal breeding will include courses in genetics and zoology; those taking major work in animal nutrition will include courses in physiology, chemistry bacteriology and those taking major work in animal reproduction will also take courses in anatomy, physiology and chemistry.

Prerequisite to major graduate work is the completion of an undergraduate program in general animal husbandry, dairy husbandry and/or related sciences necessary for the pursuance of the particular graduate field chosen. Basic courses in chemistry, mathematics and zoology are helpful in the pursuance of all animal husbandry graduate work.

Open to graduate students for minor only: 319, 350, 403, 425, 427, 429, 431, 434, 436, 437, 460, 490.

Courses Primarily for Undergraduate Students


111. Livestock Problems. (2-3) Cr. 3. F. Relation of livestock to agriculture and human welfare. Beef cattle and sheep. Selection, judging, carcass studies, markets, market classifications, breeding and management.


114. Elements of Livestock Production. (2-3) Cr. 3. W. A. For students in agricultural business and others by special permission. B. For winter quarter program students
ANIMAL HUSBANDRY

115. Livestock Problems. (1-2) Cr. 2. W. Breeds of horses for work and pleasure. Selecting, judging, breeding, management and marketing.

125. Livestock Management. (1-3) Cr. 2. F.S. Practical problems in handling farm livestock.

135. Dairy Cattle Feeding and Management. (3-0) Cr. 3. W. Feeding standards and their application; dairy herd management practices.

211. Breeds of Livestock. (2-3) Cr. 3. F. Prerequisite: 111, 112. Breeds of dairy cattle and sheep; their use and adaptability in commercial livestock production.

212. Breeds of Livestock. (2-3) Cr. 3. W. Prerequisite: 111, 112. Breeds of beef cattle and hogs, their use and adaptability in commercial livestock production.

216. Livestock Feeding and Management. (3-0) Cr. 3. F.W. Prerequisite: 111, 112, or 114. Not for students in animal husbandry or dairy husbandry curricula. Not open to those who have taken in 415 or 410. Practical feeding and management of hogs, beef and dairy cattle, and sheep.


254. Principles of Breeding. (3-0) Cr. 3. S. Prerequisite: 111, 112, Gen. 200 or 300. Physical basis of heredity; Mendelism; livestock breeding. Not for students in animal husbandry or dairy husbandry curricula.

270. Meats. (2-3) Cr. 3. W.S. Prerequisite: 211, 212, V.Anat. 217. Comparative studies of meat animals and carcasses; slaughtering meat animals; cutting, grading, identifying, curing and freezing meat. One-day field trip.

305. Livestock Judging. (0-6) Cr. 2. F. Prerequisite: 211, 212 and V.Anat. 217. 115 recommended but not required. Beef cattle, hogs, horses and sheep. Tours and study of production methods in major livestock and crop regions of the United States and Canada. Influence of climate, soil, topography, markets and other factors on livestock and crops produced. Livestock management and crop production practices.


405. Advanced Livestock Judging. (3-0) Cr. 3. S. Prerequisite: 305. Beef cattle, hogs, horses and sheep. Trips to shows and stock farms.

409. Market Classes and Grades of Livestock. (2-0) Cr. 2. F.S. Prerequisite: 270. Classifying, grading and evaluating cattle, sheep, and hogs from standpoint of market. Field trips.

415. Livestock Production. (3-0) Cr. 3. W.S. Prerequisite: 218. Not for students in animal husbandry or dairy husbandry curricula. Fundamentals of nutrition applied to livestock feeding, management of herds and flocks. Composition and digestibility of feeding stuffs; feeding standards and calculation of rations for beef cattle and sheep.

416. Livestock Production. (3-0) Cr. 3. W.S. Prerequisite: 218. Not for students in animal husbandry or dairy husbandry curricula. Fundamentals of nutrition applied to livestock feeding, management of herds and flocks. Composition and digestibility of feeding stuffs; feeding standards and calculation of rations for dairy cattle and hogs.

425. Swine Production and Marketing. (3-0) Cr. 3. W.S. Prerequisite: 810.

427. Beef Cattle Production and Marketing. (3-0) Cr. 3. W.S. Prerequisite: 819.

429. Sheep Production and Marketing. (2-0) Cr. 2. F.S. Prerequisite: 819.


433. Dairy Production and Herd Management. (3-0) Cr. 3. F. Prerequisite: 819. Not open for credit to those who have credit in 165. Preparation of feeds; computing rations for milking herd, young stock, and sires. Management of specialized and general dairy farms.

435. Advanced Dairy Cattle Judging. (0-6) Cr. 2. F. Prerequisite: 305. Training in dairy cattle judging and reasons. Trips to dairy farms and shows. Open only to approved students.
Courses for Undergraduate and Graduate Students

505. Advanced Non-Ruminant Nutrition. (8-0) Cr. 8. W.
Prerequisite: 319, Chem. 574, Mr. Carton.
Nutrition requirements for maintenance, growth, fattening, reproduction, and lactation in the non-ruminant animal.

506. Advanced Ruminant Nutrition. (3-0) Cr. 3. W.
Prerequisite: 519, Chem. 574, Mr. Burroughs.
Digestion, absorption and metabolism of nutrients as related to maintenance, growth, lactation and reproduction in ruminants.

Courses for Graduate Students

603. Seminar in Animal Nutrition and Meats. (P.H. 609) (1.0) Cr. 1. F.W.S.
Prerequisite: Permission of instructor.
Matters of family basis, selection indices, records of performance, methods of estimating heritability, comparison of various breeding plans.

Prerequisite: Permission of instructor.
Embryology, structure of function of endocrine organs.

A seminar presenting current concepts in nutrition and related fields. Required for all graduate students in nutrition.

690. Research.
E. Animal Reproduction. Mr. Melampy.

APPLIED ART

Marjorie S. Garfield, M.F.A., Head of Department

Professors: Harriet Adams, M.A.; Mabel C. Fisher; Edna O'Bryan, B.A.
Associate Professors: Gladys E. Hamlin, M.A.; Mary L. Meixner, M.A.; Christian Petersen; Neva M. Petersen, M.S.; Alice H. Waugh, B.S.
Assistant Professors: June C. Brown, B.S.; Alice Davis, M.A.; Shirley E. Held, M.S.; Janet L. Navin, M.S.
Instructors: Helen K. Fidlar, M.S.; Emelda Kunau, B.S.; Margaret R. Polson, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in applied art leading to the degree of Bachelor of Science, see page 82.
The department offers instruction in the design and use of materials for the individual, the home and the community.

Students majoring in applied art may obtain positions as extension specialists and as teachers of art, if certification requirements are also met. The commercial field offers positions in designing; interiors, home furnishings, advertising, greeting cards; in media such as textiles, wood and metal.

Students applying for advanced credit must submit representative work.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science, and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of undergraduate work in applied art substantially equivalent to that required in the undergraduate curriculum in applied art at this institution.

Open to graduate students for minor only: 305, 400, 434, 445, 464, 485, 486.

Courses Primarily for Undergraduate Students

103. Basic Design. (2-6) Or. 4. F.W.S.
Creative problems in design and color with emphasis on art elements and principles.

211. Fashion Illustration. (0-6) Cr. 2 each. F.W. (211) Prerequisite: 103.
Introduction to the Illustration of the fashion figure; layout.
(212) Prerequisite: 211. W.S. Emphasis upon rendering accessories and the costume figure in a variety of media.

231, 232, 233. Drawing and Composition. (0-6) Or. 2 each. Yr. A.A. majors must start this sequence fall quarter of the sophomore year. (231) Prerequisite: 103.
Introduction to drawing; perspective; freehand sketching.
(232) Prerequisite: 231.
Drawing and pictorial composition. (233) Prerequisite: 232.
Watercolor painting.

Creative problems involving techniques and art essentials. (242) Prerequisite: 241.
Advanced problems in techniques and art essentials.

260. House Planning. (0-6) Or. 2. (To be discontinued March 1958) F.W. Prerequisite: 103.
Use of space within the house planned for comfort, economy and beauty. Historic styles and their relation to modern design.

261. Basic House Planning and Interior Design. (2-6) Or. 4. F.W.S. Prerequisite: 103.
Principles of design and color applied to the exterior, interior and furnishings of the house. Students taking this course will not be given credit for 260 or 264.

264. Basic Interior House Design. (1-6) Or. 3. (To be discontinued March 1958) F.W. Prerequisite: 103.
Design and color applied to the interior of the house; historic styles.

305. Advertising Design. (0-6) Or. 2. F.W. Prerequisite: 103.
Lettering and design; printing techniques.

324. Life Drawing. (0-6) Or. 2. W. Prerequisite: 212 or 232.
Figure drawing in different media.

344. Craft Design. (0-6) Or. 2. F.W.S. Prerequisite: 103.
Weaving and wood. Primarily for majors in applied art; open to students in other departments if space permits.

345. Craft Design. (0-6) Or. 2. F.W.S. Prerequisite: 103.
Books, metal and leather accessories.

384. Survey of Art. (3-0) Or. 3. F.W.S. Prerequisite: 103.
Survey of architecture, sculpture and painting with emphasis on appreciation.

398. Sculptural Design. (0-6) Cr. 2. F.W.S. Prerequisite: 103.

400. Special Problems. Or. 1 to 3. F.W.S. Prerequisite: Permission of instructor. Special problems to be used only when existing course offerings have been taken. A. Composition and Painting. Prerequisite: 233 or 324 or 424. B. Textile Design. Prerequisite: 285. C. Craft Design. Prerequisite: 445. D. Sculptural Design. Prerequisite: 389. E. House Planning or Interior House Design. Prerequisite: 565. F. Advertising Design. Prerequisite: 405. G. Fashion Illustration. Prerequisite: 212. H. Methods and Media in Art. (For art majors planning to teach) Prerequisite: Permission of head of department.

401. Senior Study Tour. Required. F. Prerequisite: Senior applied art classification. Visit professional studios, retail establishments and art museums for approximately one week.

404. Seminar. Or. 1 or as arranged. Prerequisite: 12 credits in applied art; Art discussion.

405. Advanced Advertising Design. (0-6) Or. 2. W.S. Prerequisite: 305. Lettering and layout; variety of media.

424. Painting and Composition. (0-6) Or. 2. F.S. Prerequisite: 233. Pictorial composition—oil, tempera, watercolor.
Courses for Advanced Undergraduate and Graduate Students

535. Advanced Textile Design. (0-6) Cr. 2 to 4 (maximum 2 credits per quarter). W.S. 
Prerequisite: 484. 
Screen printing and other media.

546. Jewelry Design. (0-6) Cr. 2 to 4 (maximum 2 credits per quarter). W.S. 
Prerequisite: 434.

Courses for Graduate Students

600. Advanced Design. 
Credit as arranged. F.W.S. 
Prerequisite: B.S. or B.A. in applied or related art or satisfactory evidence of ability. 
A. Composition and Painting. Miss Garfield 
B. Textile Design. 
C. Craft Design. 
D. Sculptural Design.

E. House Planning or Interior House Design. 
F. Advertising Design.

605. Seminar. 
Credit as arranged (Credit for divisional seminar). F.W.S. Miss Garfield

614. Research. F.W.S. 
Miss Garfield

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

LEONARD WOLF, M.S., Head of Department

PROFESSORS: Lawton M. Patten, B. Arch.; Clair B. Watson, M.F.A.; John Weber, Jr., M.S.

ASSOCIATE PROFESSORS: Roscoe O. Lorenz, M.S.; Richard D. McConnell, M.S.

ASSISTANT PROFESSORS: Arthur E. Burton, M.S.; Donald I. McKeown, M.S.; Bernard J. Slater, M.S.; Carl M. Wise, B.S.

Opportunities for Undergraduate Study

The program for both architecture and architectural engineering students is identical for the first two years.

For the undergraduate curriculum in architecture leading to the degree of Bachelor of Architecture, see page 69.

The curriculum in architecture prepares the student for the professional career of architect. Its major aim is preparation for efficient service as a designer in an architectural organization and provides him with the necessary foundation to progress ultimately to independent architectural practice in accordance with the professional registration laws of the various states. The student is required to have at least one summer of employment with a professional architectural firm. On completion of the third year only those students who have demonstrated superior ability in design will be certified for admission to the fourth year of the curriculum leading to the Bachelor of Architecture degree.

For the undergraduate curriculum in architectural engineering, leading to the degree of Bachelor of Architectural Engineering, see page 70.

The curriculum in architectural engineering prepares the student for the career of professional engineer with specialization in one of the following fields: structural design, mechanical and electrical equipment of buildings, construction, development and production of building materials. The student is required to have at least one summer of field experience in building construction.

To meet the requirements of national competitions, problems may be given in either program over the weekend instead of the regularly scheduled laboratory periods.
In cooperation with the Department of Industrial Administration, a program of study is provided for those who are interested in business as related to the building and related industries. This program leads to the degree of Bachelor of Science, with a major in industrial administration and a minor in architecture. For particulars, the head of either department should be consulted.

All work submitted by students becomes the property of the department to be retained, published, exhibited or returned at the discretion of the department.

Students who matriculate before January 1, 1958 may pursue the program leading to the degree Bachelor of Science in Architectural Engineering provided they meet the requirements for the degree by June, 1961.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in architectural engineering, and minor work to students taking major work in other departments. For those students who are interested in entering the field of building construction, major work is taken in this department; minor credit is usually earned in industrial engineering or industrial administration.

Prerequisite to major graduate work is the completion of a standard curriculum in architectural engineering substantially equivalent to that required of undergraduates at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only: Arch. 441, 442, 443, 461, 462, 463; Arch.E. 413, 414, 415.

Courses in Architecture

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Required. S.

108. Architectural Drawing.
(0-0) Cr. 2, S.
Prerequisite: E. Dr. 132A or 132.
Introduction to architectural drawing, perspective, shades and shadows and freehand sketching.

200. Seminar. (1-0) Required. W.
Historical survey of American architecture.

201, 202, 203. "Architectural Design and
Analysis I." (0-15) Cr. 6 each. Yr.
201. Prerequisite: 102.
202. Prerequisite: 201.
208. Prerequisite: 202.
Introduction to architectural design with emphasis on projects involving small buildings of wood frame and light masonry construction. An integration of the principles of pure design and freehand drawing in pencil, pen and ink and color with application to architecture.

214. Basic Freehand Drawing.
(0-6) Cr. 2, F.W.S.
Beginning drawing and sketching in pencil and charcoal from studio and outdoor objects. Study of proportion, perspective and form.

217. Basic Freehand Drawing in Color.
(0-6) Cr. 2, F.W.S.
Prerequisite: 214.
Elements of composition and color theory. Studio and outdoor problems in water color and black and white.

304, 305, 306. Architectural Design II.
(0-15) Cr. 5 each. Yr.
304. Prerequisite: 203.
305. Prerequisite: 304.
306. Prerequisite: 305.
More advanced projects of architectural design with emphasis on planning and the study of circulation. More advanced structural techniques and the broader use of materials. Freehand sketching, model making and application of pure design principles to architectural enrichment.

321. Advanced Freehand Drawing.
(0-6) Cr. 2 each time elected. F.W.S.
Prerequisite: 203 or 214 or equivalent. A. Pencil, B. Black and white media, C. Color media.

827. Advanced Graphic Techniques.
(0-6) Cr. 2 each time elected. F.W.S.
Prerequisite: 6 hours of freehand or drawing or Arch. 806 and approval of the head of the department. A. Air brush, B. Silk screen, C. Block print and etching.

832. Advanced Two and Three Dimensional Design.
(0-6) Cr. 2 each time elected. F.W.S.
Prerequisite: 6 hours of freehand drawing or Arch. 806 and approval of the head of the department.
A. Two dimensional design.
B. Three dimensional design.

834. Residential Architecture.
(4-0) Cr. 2. S.F.
Principles of planning and design of small houses with consideration given to site selection, financing and home owners' needs.

835. Residential Architecture.
(4-0) Cr. 2. S.
Principles of planning and design of larger houses with consideration given to kitchens, multi-purpose rooms, equipment, building materials and construction methods.

838. Housing. (4-0) Cr. 2. S.
Prerequisite: Junior classification.
Principles of planning and design of group or multiple housing with consideration given to social, economic and political aspects of this problem.

(3-0) Cr. 3 each. Yr.
Prerequisite: 203.
Materials and forms of architecture as adapted to the environmental, social and
economic conditions of the past with application to contemporary architectural development.

400. Senior Inspection Trip. Required. F. Prerequisite: Senior Arch. or Arch. E. Visits to buildings under construction and existing manufacturing plants for one week.

410. Seminar, (1-0) Required. S. Prerequisite: Senior Arch. or Arch. E. Prepared discussions of architectural problems or related subjects.

416, 417, 418. Architectural Design III. (1-18) Cr. 7 each. F.W.S. Prerequisite: 408 and credit or classification in O.E. 438. Projects in the design of large complex buildings; program analysis, pure design theory and research, model making, sketching and rendering in special pencil media. Field trip.

426. Special Problems in Architecture. (0-9 to 27) Or. 3 to 6. F.W.S. Prerequisite: Senior or graduate classification. Permission of department head. Investigation of problems of special interest to the student.

Courses for Advanced Undergraduate and Graduate Students

521, 522, 523. Architectural Design IV. (2-16) Or. 8 each. Yr. Prerequisite: 518 and O.E. 438. 522. Prerequisite: 521. 523. Prerequisite: 522. Projects concerning groups of buildings. Office practices, including programming, research, design, working drawings, estimating and specifications. Field trip.

Courses in Architectural Engineering

Courses Primarily for Undergraduate Students

513, 514, 515. Design and Analysis of Architectural Structures II. (0-9) Or. 8 each. Yr. Prerequisite: 503. 514. Prerequisite: 513. 515. Prerequisite: 514. Architectural projects in the design of structural members. Emphasis on construction techniques with emphasis on wood frame, masonry wall-bearing and monolithic concrete.

413, 414, 415. Design and Analysis of Architectural Structures III. (0-9) Or. 3 each. Yr.

Courses for Advanced Undergraduate and Graduate Students


Courses for Graduate Students

600. Advanced Design Analysis. Or. 1 to 15. F.W.S. Mr. Wolf

604. Research. Mr. Wolf


BACTERIOLOGY

LOYD Y. QUINN, Ph.D., Associate Professor, Acting Head of Department


INSTRUCTOR: Clarence L. Baugh, M.S.
Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in bacteriology, leading to the degree of Bachelor of Science, see page 96. Phys. 213 or equivalent, and Chem. 211 or equivalent, are required of all majors in bacteriology.

Students who specialize in this department receive fundamental training in general and technical bacteriology such as will fit them to be agricultural bacteriologists, soil bacteriologists, dairy bacteriologists, veterinary bacteriologists, industrial bacteriologists, food bacteriologists, sanitary bacteriologists, and experts in bacteriology as related to the home. The department offers undergraduate work carefully selected to provide sound preparation for work at the Ph.D. level.

Undergraduate majors in this department usually have included the following basic courses in their programs: 304A, 401, 436, 534, 535, 575, and Seminar. As supporting work, undergraduate majors have found the following courses desirable: Chem. 101, 102, 103, 321, 322, 323; Phys. 211, 212, 213; Math 211, 212, 213. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in physiological, systematic, soil, dairy, veterinary, sanitary, food, and household bacteriology; and minor work to students taking major work in other departments.

Specific prerequisite to major graduate work in bacteriology is the completion of at least one thorough course each in general bacteriology, chemistry (including inorganic and organic) and physics. Physiological and biophysical chemistry are advised. Students taking major work in soil bacteriology should have completed courses in soils substantially equivalent to those required of undergraduates in the curriculum in agronomy at this institution. Students taking major work in dairy bacteriology should have completed courses in dairy and food industries substantially equivalent to those required of undergraduate students in dairy and food industries at this institution. Students taking major work in physiological bacteriology should have completed courses in biochemistry, physics, and at least one year of organic chemistry. A minor in chemistry is required.

Minor work is recommended in physiological, physical, biophysical, organic and sanitary chemistry; biochemistry; mathematics and physics.

Open to graduate students for minor only: 350, 401, 436, 450, 458.

Courses Primarily for Undergraduate Students

200. General Bacteriology.
   (8-6) Cr. 3. F.W.S.
   Prerequisite: Chem. 101.
   Non-technical discussion of the role of bacteria in everyday life: health, industry, agriculture, the home; sanitation; war. Not intended for students taking 304. Does not carry credit as a prerequisite for advanced courses in bacteriology.

304. General Bacteriology I. F.W.S.
   Prerequisite: Organic Chemistry. (Exception 304D. Prerequisite: General Chemistry.)
   A. Students in agronomy, dairy and food industries and science. (8-6) Cr. 5. F.W.S.
   B. Students in home economics. (3-6) Cr. 5. F.W.S.
   C. Students in chemical engineering. (3-3) Cr. 4. 8.
   D. Students in civil engineering. (2-3) Cr. 3. F.W.
   E. Students in animal husbandry, forestry, horticulture, poultry husbandry and agricultural journalism. (3-6) Cr. 5. F.W.S.
   Morphology, classification, physiology, and cultivation of bacteria; relation of bacteria to health of man, animals and plants; the home, sanitation and industry.

350. Dairy Bacteriology.
   (D.F.I. 350) See Dairy and Food Industries.

401. General Bacteriology II.
   (8-6) Cr. 5. F.
   Prerequisite: 304A or B.
   Intermediate morphology, cytology, and physiology of microorganisms.

404. Special Problems.
   Or. 1 to 5. Permission of head of department. F.W.S.

436. Laboratory Methods and Diagnosis.
   (2-6) Cr. 4. 8.
   Prerequisite: 304A or B. Mr. Quinn

450. Special Dairy Bacteriology.
   (D.F.I. 450) See Dairy and Food Industries.

458. Milk Inspection.
   (D.F.I. 458) See Dairy and Food Industries.
Courses for Advanced Undergraduate and Graduate Students

581. Physiology of Viruses. (3-6) Cr. 8 or 5. Alt. F. Offered 1957. Prerequisite: 584A or B. History, nature, classification and taxonomy, physiology and metabolism of viruses.

584. Sanitary Bacteriology. (2-6) Or. 4. Prerequisite: 304. Microorganisms in water supplies; bacteriology of sewage; disinfection and disinfectants.

585. Food Bacteriology. (2-6) Or. 4. Prerequisite: 304A or B. Bacteria, yeasts and molds in food products; food industries; food processing and its bacteriological control.


Courses for Graduate Students

661, 662, 663. Physiology of Bacteria. (12-0 or 6) Cr. 8 or 5. Yr. Mr. Werkman

- (661) Influence of chemical and physical environment on bacteria; bacterial nutrition.
- (662) Bacterial metabolism functions of intermediary catalysts.
- (663) Industrial fermentations.

684. Physiology of Bacteria. (2-0) Or. 3. Offered on request. Prerequisite: Permission of the head of the department. Selected topics in the field of physiological and chemical bacteriology.


690. Research.

A. Soil Bacteriology. (Agron. 690A)
B. Pathogenic Bacteriology. Messrs. Baker, Merchant, Schwarte
C. Dairy Bacteriology. (D.F.I. 690C)
D. General or Systematic Bacteriology.

691. Seminar. Or. 1 each. Yr. Immunity and Serum Therapy.

692. Permission of instructor. Mr. Werkman

555. Immunology and Serum Therapy. (3-0) Or. 4. Prerequisite: 304A or B. Theories of immunity and immunization, preparation of vaccines, and sera.


557. Special Topics. Cr. 2 to 4. F.W.S. A. Soil Bacteriology. (Agron. 656). Prerequisite: Permission of instructor. B. General Bacteriology. Mr. Werkman


BOTANY AND PLANT PATHOLOGY

Wendell H. Bragonier, Ph.D., Head of Department

PROFESSORS:

ASSOCIATE PROFESSORS:

ASSISTANT PROFESSORS:

INSTRUCTORS:
Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in botany, leading to the degree of Bachelor of Science, see page 96.

For undergraduate curriculum in plant pathology leading to the degree of Bachelor of Science contact Head of Department.

The department offers a liberal science training in many basic and applied aspects of plant study. The undergraduate programs are adapted to students of varied interests and prepare them for a wide range of opportunities in science and science-related occupations. Botany majors secure employment as science teachers, conservationists, seedsmen, representatives in sales and development for commercial organizations, recreation specialists, science writers and consultants, technicians in nurseries, canneries, tropical plantations, and seed laboratories, and as inspectors in plant disease control and quarantine. Students in the upper half of their graduating class are well prepared for graduate training leading to the professional degrees, Master of Science and Doctor of Philosophy. Many receive scholarships and assistantships which provide opportunities to work with nationally known research scientists and teachers. Upon completion of graduate work they secure positions on the teaching and research staffs of leading educational institutions in the United States and foreign countries, as research scientists in the United States Department of Agriculture, and in research and development sections of food processing and chemical companies. The Master's and Doctor's degrees are definitely worth the additional time and effort required.

The Iowa State College Seed Laboratory offers unusual opportunities for securing formal course work in seed technology and at the same time provides practical experience through hourly employment.

Undergraduate programs in the department include the following basic courses: 101, 102, 204, 205, 206, 407, and 424, supplemented with others from the following: 256, 257, 216, 304, 305, 338, 355, 438, 504, 506, 599. Undergraduate minor programs and supporting courses usually include: Bact. 304A; Chem. 101, 102, 103, 211, 334, 335; Gen. 300; Geol. 100, Math. 101, 102, 103, or 111, 112, 113; Phys. 211, 212, 213; Zool. 104, 105, 224, 274, 351. Additional courses may be taken in agronomy, horticulture, forestry, mathematics, geology and zoology. Botany majors are urged to register for courses at the Iowa Lakeside Laboratory on Lake Okoboji one or more summer sessions. These courses are not fixed requirements, nor are they all the courses required for graduation. They are merely a guide to the student and his adviser for planning a curriculum to fit the student's individual needs.

Staff members of the department serve as advisers for small groups of students to explain the basic requirements of the science curriculum and help students plan programs suited to their needs. Arrangements are made frequently for part-time employment in the research laboratories and greenhouses so students can learn first hand about the nature and importance of work done by botanists.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in plant ecology, morphology, mycology, pathology, physiology, and systematic and economic botany; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of thirty undergraduate credit hours in botany, together with supporting work in basic and applied science. Undergraduate courses in bacteriology, zoology, farm crops, or horticulture may be substituted in part for botany upon recommendation of the head of the department. Students desiring to take major work in plant physiology should present undergraduate credits in inorganic and organic chemistry; courses in physics and mathematics are desirable. Students wishing to major in plant pathology should present undergraduate credits in bacteriology and organic chemistry; courses in horticulture or farm crops are desirable. Students desiring to do major work in systematic botany should have prerequisites in general morphology.

Students majoring in botany will usually select minors from bacteriology, chemistry, farm crops, forestry, genetics, geology, horticulture, physics, soils or zoology and entomology.

Open to graduate students for minor only: 407, 416, 424, 438.
Courses in Botany

Courses Primarily for Undergraduate Students

101. General Botany. (0-6) Cr. 3. F.W.S. 
Introduction to the science of botany. Food production; structure, growth and reproduction of seed plants.

102. The Plant Kingdom. (0-6) Cr. 3. W.S. 
Prerequisite: 101.
Nature, reproduction and possible relationships of the algae, fungi, mosses, liverworts, ferns, horsetails, club mosses, gymnosperms and angiosperms.

204. Elementary Plant Anatomy. 
(0-6) Cr. 3. S. 
Prerequisite: 101.
Structure and relationships of reproductive organs of vascular plants; derivation, development, and external form, positional relationships and anatomy of organs.

205. Elementary Plant Physiology. (2-4) Cr. 4. F.W.S. 
Prerequisite: 101, Chem. 102.
Principles of absorption, conduction, transpiration, photosynthesis, respiration, growth, and reproduction.

206. Elementary Plant Taxonomy. 
(2-6) Cr. 4. S. 
Prerequisite: 101.
Principles of classification of seed plants; survey of major plant families; identification and field study of local plants. May be taken for 7 or 8 credits at the Iowa Lakeside Laboratory.

216. Weed Identification and Control. 
(2-6) Cr. 4. F. 
Prerequisite: 101.
Identification of weeds and other economic plants. Outline of plant classification to aid in identification of unknown weeds. Fundamental principles of cultural and chemical weed control.

256. Dendrology. (1-4) Cr. 3. F. 
Prerequisite: 206.
Families, genera, and species of North American trees, angiosperms.

257. Dendrology. (1-4) Cr. 3. W. 
Prerequisite: 206.
Families, genera, and species of North American trees, gymnosperms.

(2-2) Cr. 3. Alt. W. Offered 1958 
Prerequisite: 101, Chem. 101, and junior classification.
Food and beverage plants. Plants and plant products used as food for man and livestock; emphasis on those grown or used in the United States. Grains, forage crops, fruits, vegetables, condiments, beverages, nuts, sugars.

Botany of Economic Plants. 
(2-2) Cr. 3. Alt. W. Offered 1959 
Prerequisite: 101, Chem. 101, and junior classification.
Plants and plant products used in industry and technology; fibers, rubber, wood and wood products, tobacco, medicinal plants, gums, waxes, oils.

338. Seed Analysis. 
(1-4) Cr. 3. Alt. W. Offered 1959 
Prerequisite: 216, Agron. 114.
Techniques of seed analysis used in official and commercial testing. Principles of determining seed purity and viability.

355. Field Botany. 
(0-6) Cr. 3. S. 
Prerequisite: Junior classification.
Idenification of community trees, shrubs and wildflowers with simple keys. Utilization of plant materials in secondary education. May be taken for 7 or 8 credits at the Iowa Lakeside Laboratory.

424. General Plant Ecology. 
(2-3 or 6) Cr. 3 or 4. F.S.
Prerequisite: 205.
Nature of crop vegetation in relation to factors of environment; application to forestry, grazing, and general plant production. May be taken for 7 or 8 credits at the Iowa Lakeside Laboratory.

438. Seed Viability. 
(1-4) Cr. 3. Alt. W. Offered 1958 
Prerequisite: 205.
Principles and methods of seed germination; factors affecting viability and dormancy; physiology of germination.

456. Poisonous Plants. 
(2-4) Cr. 3. F. 
Prerequisite: 101, V.Phys. 164, or permission of instructor.
Classification, distribution, identification, and control of poisonous plants; principal types of plant poisons and their effects on animals.

474. Special Problems. 
Cr. 2 to 5. F.W.S. 
Prerequisite: 15 credits in botany.
A. Morphology.
B. Physiology.
C. See courses in plant pathology.
D. Mycology.
E. Systematic Botany.
F. Plant Ecology.
G. Economic Botany.

Graduate Students

504. Plant Cytology. (2-4) Cr. 3. F. 
Prerequisite: 15 credits in biological science. Chem. 335 recommended.
The anatomy and physiology of cytoplasm and nucleus. Cell division and the role of the cell in reproduction.

506. Principles of Mycology. (2-3) Cr. 3. F. 
Prerequisite: 407, or 416, or 417, or Bact. 304A. Mr. Gilman.
Morphology, cytology and physiology of fungi; their relation to agriculture and industry.

511. 512, 518. Plant Physiology. 
(3-0) Cr. 3 each. F.W.S. 
Prerequisite: 205, Chem. 211, 336. Mr. Loomis.
Water relations of plants, minerals and organic nutrition. Physiology of growth and reproduction.

514. Plant Metabolism. 
(3-0) Cr. 3. W. 
Prerequisite: 205 and credit or classification in Chem. 335. Mr. Aronoff.
Metabolic pathways in plants.
567. Botanical Microtechniques. (1-6) Cr. 3. E. 
Prerequisite: 205. Methods of killing, embedding, sectioning, and staining plant material. Preparation of sectioning and recording microscopic preparations. Use of microtome, microscopy, projection photomicrography.

566. Advanced Plant Anatomy. (2-4) Cr. 4. W. 
Prerequisite: 204, 205 or equivalent. Mr. Sass. 
Principles of plant anatomy. Tissue systems of vegetative organs of vascular plants.

565. Advanced Field Botany, (2-12) Cr. 3. SS. 
Prerequisite: 206. Mr. Pohl. 
Principles of plant classification; liquification of local flora. Field trips to localities of outstanding biological interest in Iowa.

566. Native Range Plants, (1-6) Cr. 3. W. 
Prerequisite: 206, Mr. Pohl. 
Not open to students with credit in 596. Geographic distribution, identification, and use of native grassland and forest forage plants.

575. Field Mycology, (2-12) Cr. 3. SS. 
Prerequisite: 407, or 416, or 417. Biology of fungi and relations of their occurrence to environment. 

Courses for Graduate Students

605. Cyto genetics. 
(General: 605) (2-3) Cr. 3. W. 
Prerequisite: 504 and Gen. 300. Principles of plant taxonomy and the use of native grassland and forest forage plants.

618. Enzymes in Plant Metabolism. (6-0) Cr. 3. S. 
Prerequisite: Permission of instructor. Mr. Smith. 
Nature of enzyme action, their role in metabolism, and methods of investigation.

624. Physiology of Fungi. (6-0) Cr. 3. Alt. W. Offered 1958. 
Prerequisite: 504 or permission of instructor. Mr. Smith. 
Special physiology of fungi; nutrition, metabolism, growth and toxicology.

641, 642, 643. General Mycology. (2-6) Cr. 4 each. Yr. 
Prerequisite: 407, or 416, or 417. Mr. Gilman. 
Taxonomy, morphology and phylogeny of slime molds and fungi (ascomycetes, basidiomycetes, fungi imperfecti, and basidiomycetes).

695. Research. 
A. Morphology. Mr. Sass. 
B. Physiology. Mr. Aikman. 
C. Taxonomy. Mr. Gilman. 
E. Systematic Botany. Mr. Smith. 
G. Economic Botany. Mr. Smith.

698. Seminar. F.W.S. 
Meetings of botanical staff and students to discuss recent literature, and problems under investigation. 
A. For students taking major work in morphology and taxonomy. Or. 1. Mr. Aikman. 
B. For students taking major work in physiology and ecology. Or. 1. Mr. Aikman. 
C. For students in plant pathology.

Courses in Plant Pathology

Courses Primarily for Undergraduate Students

407. Principles of Plant Pathology. (2-4) Cr. 4. W.S. 
Prerequisite: 102 and 205 or permission of instructor. 
Principles underlying the nature and control of plant diseases.
Courses for Advanced Undergraduate and Graduate Students

Prerequisite: 571. Mr. Buchholtz.
Exclusion, eradication, protection and disease resistance as a means of control or prevention of plant disease.

536. Methods of Research in Plant Pathology. (2-6) Cr. 4. F.
Prerequisite: 571, or 572, or 573.
Introduction to the theory and practice of research in plant pathology.

571. Advanced Plant Pathology. (2-6) Cr. 3. F.
Prerequisite: 407, or 416, or 417. Mr. Buchholtz.
Diseases of field and horticultural crops caused by phycomycetes and ascomycetes.

572. Advanced Plant Pathology. (2-8) Cr. 3. W.
Prerequisite: 407, or 416, or 417. Mr. Buchholtz.
Diseases of field and horticultural crops caused by bacteria and viruses.

Courses for Graduate Students

635. Host-Parasite Interactions. (2-6) Cr. 3. Alt. S. Offered 1959.
Prerequisite: 0 graduate course credits in pathology or mycology. Mr. Buchholtz.
Phenomena of infection and response in plants parasitized by fungi, bacteria and viruses.

695. Research.

CERAMIC ENGINEERING

CHARLES M. DODD, Cer.E., Head of Department


Opportunities for Undergraduate Study

For undergraduate curriculum in ceramic engineering, leading to the degree of Bachelor of Science, see page 71.

Ceramic engineering deals with those products formed from earthy minerals which are rendered durable by a process of heat treatment at high temperatures. This includes most of the non-metallic inorganic substances manufactured into such commodities as structural clay products, fire brick and refractories, white wares (including dinnerware, chemical and electrical porcelain, floor and wall tile), glass, porcelain enamels on metals, art pottery, cements (limes and plasters), abrasives and many other similar products.

The ceramic engineer is concerned with the technical problems encountered in the development, control, production and use of these products. He must also be well-versed in the methods employed for winning, forming, drying and firing of ceramic raw materials. The ceramic engineer receives a well-rounded education to fit him for research, production, equipment and plant design or sales engineering depending upon the capabilities and inclination of the individual.

Opportunities for Graduate Study

The department offers major work leading to the degrees of Master of Science and Doctor of Philosophy in ceramics and ceramic engineering, and minor work to students taking major work in other departments. Minor work will be selected in related fields.

Prerequisite to major graduate work is the completion of a curriculum in ceramic
**CERAMIC ENGINEERING**

engineering, ceramic technology, engineering or physical science equivalent to that required of undergraduate students at this institution.

Open to graduate students for minor only: 415, 416, 417.

**Courses Primarily for Undergraduate Students**

101. Orientation. (1-0) Required. S.


218. Ceramic Raw Materials. (4-0) Cr. 4. E.

Prerequisite: Chem. 103.

Geological formation; occurrence; behavior; chemical and physical properties of the more important ceramic raw materials.

214. Winning, Preparation and Forming. (4-0) Cr. 4. W.

Prerequisite: 218.

Prospecting for, and winning, ceramic raw materials. Preparation and forming methods.

216. Ceramic Calculations and Pyrometry. (3-8) Or. 4. S.

Prerequisite: 214.

Body and glass calculations. Units. Material and energy balances. Pyrometry.

301, 302, 308. Seminar. (1-0) Required. Yr.

309. Physical and Chemical Properties of Ceramic Materials. (3-9) Or. 6. E.

Prerequisite: 208.

Calculations; determinations with clays and other ceramic materials in the raw, plastic, and finished state.

311. Ceramic Colloids and Phase Equilibria. (4-0) Or. 4. E.

Prerequisite: 213.

Fundamental phenomena found in ceramic and related colloids. Phase equilibria in ceramic compositions.

312. Vitreous State. (3-0) Cr. 8. W.

Theory of vitreous state in ceramic glasses and bodies. Glasses formation and colors in vitreous state.

315. Ceramic Bodies, Glasses and Colors. (3-0) Or. 8. W.

Prerequisite: 309 or permission of instructor.

Essentials of a ceramic body; properties and processing of types of ceramic wares; clay ware decoration; glazes and correction of their defects; colors, their composition and process of manufacture.

316. Enamels. (8-8) Or. 4. S.

Prerequisite: 309 or permission of instructor.

Sheet metal, cast iron, and jewelry enamels; their composition, processing, and finished products; tests and specifications. Laboratory in enameling practice.

322. Ceramic Engineering Operations I. (3-8) Cr. 4. W.


Engineering theory and problem solution on crushing and grinding, filtration, classification, mixing and conveying as occurring in ceramic industries.

328. Ceramic Engineering Operations II. (3-3) Or. 4. E.

Prerequisite: 322.

Drying, firing, diffusion processes occurring in ceramic industries. Fuels and combustion in ceramic kilns and driers.

400. Inspection Trip. Required. F.

Prerequisite: Senior ceramic engineering classification.

One week trip inspecting ceramic plants and studying industrial methods of production.

401. 402, 408. Seminar. (1-0) Required. Yr.

404. Refractories. (8-0) Or. 8. F.

Prerequisite: 309 or permission of instructor.

Manufacture, properties, uses, performance, and testing of basic, neutral, and acid refractories.

406. Glass Technology. (3-0) Or. 3. S.

Prerequisite: 309 or permission of instructor.

Industrial and artistic glass. Composition, raw materials, control, specifications; manufacturing processes; finished products and their properties; plant layout; machinery and equipment.

411. 412. Ceramic Products Development and Control. (1-9) Or. 4. W. 412 (1-6) Or. 8. F.W.

411. Prerequisite: 315.

412. Prerequisite: 411.

Laboratory practice with brick, tile, white wares, fine special ceramic wares and decorating materials; testing of finished products.

415. Ceramic Industries I. (2-8) Or. 3. F.

Prerequisite: 312.

Compositions, applications and nature of various ceramic bodies and glasses. General structure of the whiteware industries.

416. Ceramic Industries II. (8-0) Or. 3. W.

Prerequisite: 322 or permission of instructor.

Manufacture, properties, uses, performance and testing of basic, neutral and acid refractories.

417. Ceramic Industries III. (3-0) Or. 3. B.

Prerequisite: 312.

Plant, layout, design, economic aspects and industrial structure of the vitreous industries, enamel and glass. Inspection trip to porcelain enamel plant.

426. Ceramic Engineering Design. (2-8) Or. 5. S.

Prerequisite: 322, 323, C.E. 385, 387.

Engineering design of kilns, driers and associated equipment.

430. Ceramic Development and Control. (1-9) Or. 4. W.

Prerequisite: 322.

Development and control techniques as applied to the ceramic process.

Courses Primarily for Advanced Undergraduate and Graduate Students

511, 512, 513. Advanced Ceramic Technology. (2-0) Or. 2 each.

Prerequisite: Permission of instructor.

Fundamentals of ceramic processes, raw materials and fabrication, including refractories, glass, bodies and glazes, enamels. Offered on request.

514, 515, 516. Ceramic Technology Laboratory. (10-0) Or. 3 each.

Prerequisite: Concurrent with 511, 512, 516.

Laboratory practice in determining plasticity, shrinkage, viscosity, differential thermal analysis, glaze fit, expansion, particle size measurement.

522, 522. Physico-Colloidal Properties of Ceramic Materials. (3-0) Or. 2 each.

Prerequisite: Permission of instructor.

Fundamentals of physico-colloidal phenomena as applied to clay minerals. Offered on request.

535, 556. Physico-Colloidal Laboratory. (0-6) Or. 2 each.

Prerequisite: Concurrent with 532, 538.

550. Special Topics. Credit as arranged.

Prerequisite: Permission of instructor.
Courses for Graduate Students

611, 612, 613. Theoretical Ceramics. (3-0) Or. 3 each. Yr.
Prerequisite: Permission of instructor.
Theory of technology of ceramic materials and application to industrial methods.
Methods of determining physical properties of ceramic materials and finished products.

614, 615, 616. Ceramic Laboratory. (0-6) Or. 8 each.
Prerequisite: Concurrent with 511, 512, 513.
Physical properties of ceramic materials.

620, Seminar. (1-0) Or. 1.

621, 622, 623. Advanced Ceramic Engineering Design. (2-6) Or. 4 each.

Prerequisite: 426.
Specialized ceramic machinery, driers, kilns and plant structures.

Prerequisite: Chem. 484 or equivalent.
Fundamentals of physico-colloidal phenomena as applied to ceramics, including theories of deflocculation, rheological properties, including plasticity and anomalies; ion exchange and electro-dialysis, micromeritics.

635, 636. Advanced Physico-Colloidal Laboratory. (0-6) Or. 2 each.
Prerequisite: Concurrent with 632, 633.

900. Research. Mr. Dodd.

CHEMICAL ENGINEERING

MORTON SMUTZ, Ph.D., Head of Department

PROFESSORS: Lionel K. Arnold, Ph.D.; David R. Boylan, Jr., Ph.D.; Henry A. Webber, Ph.D.

ASSOCIATE PROFESSORS: George Burnet, Jr., Ph.D.; Raymond W. Fahien, Ph.D.

INSTRUCTORS: Edgar V. Collins, Jr., M.S.; James E. Hunt, B.S.; Maurice A. Larson, B.S.; Thomas D. Wheelock, B.S.

Opportunities for Undergraduate Study

For Undergraduate curricula in chemical engineering leading to the degree of Bachelor of Science, see page 72.

Chemical engineering is that branch of engineering concerned with the development and application of manufacturing processes in which certain physical changes of materials are involved. The chemical engineer is primarily concerned with the development, design and operation of equipment and processes for bringing about those desired changes on an industrial scale and at a profit. Chemical engineers find opportunities with manufacturers of all of the numerous chemical products of commerce such as heavy chemicals, plastics, drugs, dyes, soap and paint; with the atomic energy program; with petroleum refineries; with the food industries and with many other industries.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in chemical engineering; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that offered in chemical engineering at this institution.

Minor work will usually be selected from chemistry, mechanical engineering, mathematics, physics, statistics or nuclear science.

Open to graduate students for minor only: 361, 362, 363, 404, 411, 412, 413, 421, 422, 423, 461, 471, 472, 473.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Required. S.
A discussion of the chemical engineering profession.

161, 162, 163. Chemical Engineering Laboratory. (0-3) Or. 1 each. Yr.
Open only to students permanently excused from military training.
An approved assignment as laboratorian on special problems.

201. Introduction to Chemical Engineering. (8-0) Or. 8. F.
Prerequisite: Credit or classification in Chem. 108.
The application of stoichiometric principles to industrial problems.

202. Material Balances. (3-0) Or. 3. W.
Prerequisite: 201 or permission of instructor.
Application of material balance calculations to chemical engineering processes.

203. Energy Balances. (3-0) Or. 3. S.
Prerequisite: 202.
Application of energy balance calculations to chemical engineering processes.

361, 362, 363. Chemical Engineering Unit Operations. (3-0) Or. 3 each. Yr.
Prerequisite: 203 or permission of instructor.
Chemical engineering operations common to many industrial processes such as...
Courses for Advanced Undergraduate and Graduate Students

504. Plastics Technology. (3-0 or 4-0) Cr. 4. S. Prerequisite: Chem. 335. Mr. Arnold. Chemistry and technology of plastic resins; production and use of finished plastic products.

510. Chemical Engineering Process Control. (3-0) Cr. 3. W. Prerequisite: 363. Mr. Smutz. Mechanisms used to control industrial processes, their applications and limitations.


514. Materials of Construction for the Chemical Industries. (3-0) Cr. 3. W. Prerequisite: Permission of instructor. Mr. Boylan. Properties of materials in the presence of corrosive media; selection of materials of construction for chemical processes.

515. Organic Chemical Industries. (3-0) Cr. 3. S. Prerequisite: 363. Chemical engineering aspects of manufacture of the principal organic chemicals.

516. Heavy Inorganic Chemical and Fertilizer Industries. (3-0) Cr. 3. W. Prerequisite: 412, or permission of instructor. Manufacture of commercial fertilizers and related heavy inorganic chemicals.

517. Utilization of Agricultural By-Products. (3-0) Cr. 3. W. Prerequisite: Chem. 335. Mr. Arnold. Occurrence and chemical composition of agricultural by-products such as corn stover, corncobs, fish hulls, and straw; their present and possible utilization in insulating board, pressed board, paper, furfural, and plastics.

518. Oil Refineries. (3-0) Cr. 3. W. Prerequisite: Chem. 335. Occurrence and composition of vegetable and animal oil, and fat-bearing materials; methods of oil separation, refining, and bleaching; utilization in products such as foods, paints, and soaps.

541. Advanced Calculation Methods for Chemical Engineers. (3-0) Cr. 3. S. Prerequisite: Math. 314. Mr. Boylan. Application of advanced mathematical methods to chemical engineering problems.

542, 422, 428. Chemical Engineering Laboratory. (0-6) Cr. 2 each. Yr. Prerequisite: Credit or classification in 361, 362, 363. Laboratory and application of the theory studied in 361, 362, and 363 to the testing and use of unit operation and process equipment; computation of experimental data; application of results to process design; writing of reports.

561. Chemical Engineering Thermodynamics. (3-0) Cr. 8. F. Applications of thermodynamics to physical and chemical equilibria encountered in chemical engineering processes.

565. Advanced Unit Operations: Fluid-Solid Systems. (3-0) Cr. 3. S. Prerequisite: 363 or permission of instructor. Theory and applications of those unit operations dealing with fluid-solid systems such as fluid flow, settling, mixing, filtration.

566. Advanced Unit Operations: Multistage Operations. (3-0) Cr. 3. W. Prerequisite: 363 or permission of instructor. Theory and applications of typical multistage operations, such as distillation, absorption, extraction and ion exchange.

567. Advanced Chemical Engineering Thermodynamics. (3-0) Cr. 3. W. Prerequisite: 461. Messrs. Boylan, Smutz, or permission of instructor. Application to unit operations and processes.

568. Distillation. (3-0) Cr. 2. W. Prerequisite: 363. Mr. Webber. Binary and multicomponent distillation. Azeotropic and extractive distillation.

576. Solvent Extraction. (3-0) Cr. 3. F. Prerequisite: 363. Mr. Smutz. Theoretical and application of solvent extraction to industrial processing.

574. Advanced Plant Design. (1-6) Cr. 3. F. Prerequisite: 473 or permission of instructor. Mr. Smutz. Typical problems in plant design.

584. Applied Electro-Chemistry. (8-0) Cr. 3. S. Prerequisite: 411. Mr. Webber. Electroplating, and storage batteries; electrolytic processes of chemical manufacture; electro-refining and electro-winning; electric furnaces and electric furnace products.

585. Chemical Engineering Kinetics. (3-0) Cr. 3. S. Prerequisite: 461 or permission of instructor. Messrs. Boylan, Smutz. Theory of absolute reaction rates; mass and heat transfer in catalytic beds; treatment of differential and integral conversion data.
Courses for Graduate Students


601, 602, 603. Seminar. (3-0) Or. 1 each yr. Prerequ. of instructor.

604. Chemical Engineering Unit Operation Theory. (3-0) Or. 3 each. F.W.S.


592. Extractive Metallurgy. (3-0) Or. 3. W. Prerequ.: Math. 218 and permission of instructor. Ferrous and non-ferrous metal production, including the minor metals. Stoichiometrical relationships.

599. Special Topics. Or. 2 to 5 each time elected. F.W.S. Messrs. Arnold, Boylan, Smuts, Webber. A series of one-term courses chosen from such topics as catalytic reactor design, chemical engineering of nuclear processes, liquid-liquid extraction, cost estimation and special topics in thermodynamics.

Prerequ.: 668 and 423, or permission of instructor.

Mechanics of turbulent flow and eddy diffusion; fluid friction in smooth and rough pipes; correlation of fluid friction with heat and mass transfer; various diffusional operations involving the simultaneous exchange of heat and mass in turbulent flow.

CHEMISTRY

CHARLES A. GOETZ, Ph.D., Head of Department


INSTRUCTOR: Orville L. Chapman, Ph.D.

Opportunities for Undergraduate Study

For undergraduate curriculum in science with a major in chemistry, chemical technology, or food technology, leading to the degree of Bachelor of Science, see pages 96 and 97.

Graduates in chemistry qualify in many fields; as teachers of chemistry, as analytical or control chemists, as supervisors in industry, as technical sales personnel and as research chemists in federal, state, municipal, academic or industrial laboratories. The rapid introduction of chemical techniques in all branches of commerce and industry has caused phenomenal growth in the profession since the turn of the century. Specific mention may be made of the manufacture of glass, pigments, sugar, starch, explosives, dyes, gases, petroleum products, fine chemicals, perfumes, drugs, vitamins, hormones, solvents and the various metals and their alloys.

Undergraduate chemistry students take not only studies in chemistry but also courses in mathematics, physics, German and some in the cultural subjects. This leaves little chance for specialization within the field of chemistry, and students with the necessary high scholastic standing usually continue with graduate work where they can explore more thoroughly in the areas in which they are interested.

To meet the different needs of students of chemistry, Iowa State has two curricula, both of which lead to the Bachelor of Science degree. Both the curriculum in chemical technology and the curriculum in science, major in chemistry, prepare the student for graduate study and industrial work at the Bachelor of Science level.

For undergraduate work in food technology, see page 171.
Recognition for high school chemistry is provided by Chem. 102A, 103A, and 202A. Chemistry. 102A is open to all students who can demonstrate satisfactory proficiency at the high school chemistry level and who are also satisfactorily proficient in English and mathematics. Successful completion of 102A gives credit for Chem. 101 and 102.

Undergraduate majors in chemistry and chemical technology usually have the following basic courses or their equivalents in their programs: 101, 102, 103, 201, 202, 214, 224, 230, 234, 235, 236, 315, 316, 325, 326, 327, 330, 9 credits advanced chemistry. As supporting work undergraduate majors have found the following courses desirable: Math. 101, 102, 103, 211, 212, 213; Phys. 211, 212, 213, or 221, 222, 223. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in inorganic, analytical, physical, organic and biochemistry, and combinations and specializations within these general areas such as physical chemical metallurgy (see also metallurgy), bioorganic, biophysical, physical-organic, food and dairy (see also food technology), and household and textile chemistry. Minor work is offered to students taking major work in other departments.

In cooperation with the Institute for Atomic Research, special facilities are offered to graduate students in other departments of the college who wish to use radioactive isotopes in their research. Analytical chemistry, calculus and physics are required for this phase of chemistry.

Prerequisite to major graduate work is the completion of undergraduate work in chemistry, mathematics, and physics, substantially equivalent to that required of undergraduate students at this institution whose major is in chemical technology.

Open to graduate students for minor only: 325, 326, 327, 334, 335, 336, 347, 348, 374, 375, 379, 408, 409, 426, 466, 473, 483, 484.

Index to field of work is given by the second and third figures of course numbers:

(a) Inorganic Chemistry and Elementary Qualitative Analysis 01 to 09
(b) Analytical Chemistry 11 to 19
(c) Physical Chemistry 21 to 29
(d) Organic Chemistry 31 to 39
(e) Food and Dairy Chemistry 41 to 49
(f) Metallurgical Chemistry 51 to 59

(g) Household (Including Textile) Chemistry 61 to 69
(h) Biochemistry (Including Physiological and Nutritional) Chemistry 71 to 79
(i) Biophysical (Including Enzyme and Zymo-) Chemistry 81 to 89
(j) Research 91 to 99

Courses Primarily for Undergraduate Students

101, 102. General Chemistry.
(3-4) Cr. 4 each. 101. F.W.S.S. 102. W.S.S.
Principles of chemistry; properties of nonmetallic and metallic elements.

*102A. General Chemistry. (3-4) Cr. 4 F.
Prerequisite: One year of high school chemistry and selection by Chemistry Department.
Principles of chemistry. Properties of nonmetallic and metallic elements. Upon completion of Chem. 102A a student is given credit in both Chem. 101 and Chem. 102 with the grade earned in Chem. 102A, for a total of 8 credits.

103. General Chemistry and Qualitative Analysis. (3-4) Cr. 4 F.S.S.
Prerequisite: 102; grade of A or B in Chemistry 106, or permission of instructor.
Extention of General Chemistry; introduction to the reactions of individual elements and to group reaction as used in the determination of the composition of matter.

*103A. General Chemistry and Qualitative Analysis. (3-4) Cr. 4 W.
Prerequisite: 102A or permission of instructor.

Continuation of general chemistry; introduction to the reactions of individual elements and groups as used in the determination of the composition of matter.

105, 106. General Chemistry.
(2-4) Cr. 3 each. F.W.S.
Prerequisite: assignment by classifying dean in cooperation with the Chemistry Department, with view to competence in mathematics and English.
For Home Economics students. Principles of chemistry; properties of nonmetallic and metallic elements.

201, 202. Inorganic Chemistry.
(2-0) Cr. 2 each. 201 F.; 202 W.
Prerequisite: 103.
Principles and theories in detail.

*202A. Modern Inorganic Chemistry.
(4-0) Cr. 4. S.
Prerequisite: 108A or permission of instructor. Inorganic chemistry from the

*Chem. 108A provides a recognition not previously available in the form of credit hour savings, for high school training in chemistry. Chem. 108A and Chem. 202A permit full exploitation of this saving.
COLLEGIAL INSTRUCTION

211. Quantitative Analysis. (3-8* or 6) Cr. 4* or 5. F.W.S.
Prerequisite: 103 or 103A
A one quarter course in theory and practice of elementary gravimetric, volumetric, and colorimetric analysis.

212. Quantitative Analysis. (1-9) Or. 4. S.
Prerequisite: 211. Clay analysis.
For students in ceramic engineering.

214. Quantitative Analysis. (3-6) Cr. 5. F.
Prerequisite: 103 or 103A
Theory and practice of elementary gravimetric, volumetric and colorimetric analysis. For students majoring in chemistry or chemical technology.

224. Elementary Physical Chemistry. (3-8) Cr. 3. 8.
Prerequisite: Chem. 214, Math. 212, Physics 212 or 222.
Elementary thermodynamics and theory of the gaseous state. Homogeneous equilibria. For students majoring in chemistry or chemical technology.

230. Laboratory in Organic Chemistry. (0-6) Cr. 2 each time taken. W.S.
Prerequisite: Chem. 214. To accompany 235 and 236.

231. Organic Chemistry. (3-6) Cr. 5. F.W.S.
Prerequisite: 102.
Fundamentals of organic chemistry for students in agriculture and related fields. Laboratory includes organic preparations and some experiments in quantitative analysis. Not accepted for credit in the science curriculum.

234, 236, 238, Elementary Organic Chemistry. (0-9) Cr. 3 each. 234 F., 235 W., 236 S.
Prerequisite or corequisite: 214.
Chemistry of aliphatic and aromatic compounds. Polar reaction and heterocyclic chemistry. For students majoring in chemistry and chemical technology.

236. Organic Chemistry. (3-8 or 6) Or. 4 or 5. F.W.S.
Prerequisite: 106.
For high school economics, agriculture, business, dairy industry, rural sociology and soil science students. Fundamental principles of organic chemistry. Not accepted for credit in science curricula.

265. Food Analysis. (3-8) Cr. 5. F.W.
Prerequisite: 264.
Elementary gravimetric and volumetric analysis and methods of food analysis. Not accepted for credit in science curriculum.

266. Textile Chemistry. (3-8) Or. 5. S.
Prerequisite: 264.
Theory and practice in the chemistry of high polymers.

215. Quantitative Analysis. (3-6) Cr. 5. W.
Prerequisite: 234, 236, 235.
Theory and practice of quantitative separations, titration curves, and electroanalytical methods. For students majoring in chemistry and chemical technology.

231. Quantitative Analysis. (3-6) Cr. 5. 8.
Prerequisite: 315, 326.
Gas analysis. Physicochemical methods of analysis. Survey of analytical practice in chemical technology. The literature of analytical chemistry.

230. Laboratory in Physical Chemistry. (0-6) Cr. 1 each time taken. F.W.S.
To accompany 321, 322, 326.

231, 322, 323. Physical Chemistry. (2-9) Cr. 5 each. Yr.
Prerequisite: 245, Phys. 213 or 222. Math. 212 preferred. Math. 112 and 113 accepted.
Properties of gases, liquids and solids. Solutions, thermodynamics and thermodynamics. Chemical kinetics, electrochemistry, atomic and molecular structure. Students majoring in chemistry or chemical technology will ordinarily elect Chem. 224, 235, 236, 237.

235. Elementary Physical Chemistry. (3-0) Cr. 3. F. Offered for the first time F. 1958.
Prerequisite: 224.
Heterogeneous equilibria. Electrochemistry. For students majoring in chemistry or chemical technology.

236. Elementary Physical Chemistry. (3-0) Cr. 3. W. Offered for the first time W. 1959.
Prerequisite: 325.

237. Laboratory in Physical Chemistry. (0-6) Cr. 2 each time taken. F.W. Offered first time F. 1958.
Prerequisite: 214, 235, 236. To accompany 325 and 326.

238. Laboratory in Organic Chemistry. (0-6) Cr. 2. S.
Prerequisite: 315, 326.
Laboratory in advanced organic, physical organic, and organic analytical chemistry.

334. Organic Chemistry. (3-0 or 3) Cr. 3 or 4 each. 334, F.W., 355, W.S.
Prerequisite: 103. A course in quantitative analysis is advised. For students majoring in biological or applied sciences. Students majoring in chemistry or chemical technology will ordinarily elect Chem. 234, 235, 236.

336. Organic Chemistry. (3-0) Cr. 3 or 4. 8.
A course for students needing additional organic chemistry beyond 335. Principally polyfunctional and heterocyclic chemistry. During the sequence 334, 335, 336 the chemistry of carbohydrates, lipids, proteins, purines and pyrimidines will be covered. Premedical students must elect 334, 335, 336 with laboratory each quarter.

347, 348. Dairy Chemistry. (D.P. I. 347, 348) Cr. 5 each 347. (3-6) F.
Prerequisite: 211, 255.
Composition and changes in composition of milk in the light of milk secretion theory. The application of pH and of colorimetry to dairy manufacture. 345. (3-6)
Prerequisite: 345.
Importance of milk salts, milk fat, milk fat emulsion, milk protein and milk enzymes to the processing and keeping quality of dairy products.

349. Foods Chemistry. (D.P. I. 349) (3-0) 8.
Prerequisite: 349.
Application of proximate and physicochemical methods of analysis to the general composition of common food types and to the determination of coloring materials, preservatives and metals in foods.

370. Laboratory in Biochemistry. (0-6) Cr. 2. F.S.
To accompany 371 and 374.
Not accepted for credit toward a chemistry major.

372, 373. Dairy Chemistry. (3-0) Or. 3 each 372. F.
Prerequisite: 211, 222, 223. Math. 212 preferred. Math. 112 and 113 accepted.
Properties of gases, liquids and solids. Solutions, thermodynamics and thermodynamic, chemical kinetics, electrochemistry, atomic and molecular structure. Students majoring in chemistry or chemical technology will ordinarily elect Chem. 224, 235, 236, 237.
CHEMISTRY

371. Biochemistry. (3-0) Cr. 3. F.W.S.  
Prerequisite: 231 or 264.  
Chemical composition and reactions of living matter. Not accepted for credit toward a degree in chemistry or chemical engineering. Not accepted for credit toward a chemistry major.  
374, 375. Physiological Chemistry.  
(8-0) Cr. 3 each. 374 F., 375 W.  
Prerequisite: 235.  
Must be accepted by 370 and 379 for veterinary students. Not accepted for credit toward a chemistry major.  
374: Chemistry of the animal body: digestion; absorption.  
375: Metabolism of carbohydrates, lipids, proteins, and minerals.  
379. Laboratory in Physiological Chemistry.  
(0-0) Cr. 2. W.  
Prerequisite: 370.  
To accompany 375.  
Introduction to quantitative biochemical procedures. Not accepted for credit toward a chemistry major.

402. Systematic analysis for ions except those of rare elements, with special attention to theory and the detection of negative ions. Analysis of commercial problems.

408. Radiochemistry.  
(2-3) Cr. 3. F.  
Prerequisite: Classification in Phys. 435 or equivalent.  
For students in engineering.

409. Radiochemistry Laboratory.  
(0-0) Cr. 2. W.  
Prerequisite: 408.  
For students in engineering.

426. Radiotracer Methods.  
(2-0) Cr. 2. F.  
Prerequisite: 223, or 326, or 485, and Phys. 212.  
For students in biology and agriculture.

Courses for Advanced Undergraduate and Graduate Students

500. The History of Chemistry.  
(2-0) Cr. 2. S.  
Prerequisite: 322 or 325, 235 or 335.  
Mr. Diehl

501. Inorganic Preparation.  
(0-8 or more) Cr. 2 or more each time elected.  
Prerequisite: 202, 323 or permission of instructor.

Preparation of inorganic compounds providing experience in two or three general areas such as high vacuum techniques, none-aqueous solvents, high temperature reactions, coordination compounds, electronic spectra and radiochemistry.

505. Theoretical Inorganic Chemistry.  
(3-0) F.S.  
Prerequisite: 202 and 323 or 326.

Theoretical approach for the systematization of inorganic chemistry. Messrs. Corbett, Martin, Schaeffer.

506. Systematic Inorganic Chemistry.  
(2-0) Cr. 2 each. 506 W., 507 S.  
Prerequisite: 505.

507. Non-metallic elements.  
507: Metallic elements.  
Messrs. Corbett, Martin, Schaeffer.

511, 512, 513. Advanced Quantitative Analysis.  
Yr.  
Prerequisite: 316, 323 or 326, 236 or 336. Messrs. Banks, Diehl, Fassel, Fritz, Goetz

511. (3-0) Cr. 3. F.S.  
512 (2-0) Cr. 4. W.  
513 (0-3 to 12) Cr. 1 to 4. F.W.S.  
(511, 513) Emphasis on general methodology.

(Phys. 514, 515).  
514 or 515. Cr. 2. S.  
Prerequisite: 323 or 326.  
Phys. 218 or 223 or permission of instructor.  
Mr. Fassel

517. Principles and methods of analytical chemistry.  
517. Cr. 2. S.  
Messrs. Corbett, Martin, Schaeffer.

518. Quantitative Microchemical Analysis.  
(1-6) Cr. 2. S.  
Prerequisite: 316, 323 or 326, or 336.  
Mr. Fritz

519. Microtechniques of organic analysis.  
519. Cr. 2. S.

521, 522. Chemical Thermodynamics.  
(2-0) Cr. 2 each. Yr.  
Prerequisite: 323 or 326.  
Advanced discussion of the principles of classical thermodynamics.

524. Surface Chemistry.  
(3-0) Cr. 3. S.  
Alt. W. Offered 1959.  
Prerequisite: 223 or 326.  
Mr. Hansen

525. Macromolecules.  
(3-0) Cr. 3. Alt. F. Offered 1958.  
Prerequisite: 323 or 326, or 336.  
Physical chemistry of polymers, polymer solutions, and naturally occurring macromolecules.

Fundamental principles of radiisotope techniques and their applications to problems in biology and allied sciences.

466. Textile Chemistry.  
(3-0) Cr. 2 or 4. S.  
Prerequisite: 264.  
Reaction of fibers during modification and finishing.

473. Biorganic Chemistry.  
(3-0) Cr. 3. F.  
Prerequisite: Elementary organic chemistry.

Review and drill in organic chemistry with emphasis on applications in biology. Not accepted for credit toward a degree in chemistry or chemical engineering.

484. Biophysical Chemistry.  
(3-0) Cr. 3 each. F.W.  
Prerequisite: Math. 112 or 212 or permission of instructor.

Chem. 320 may be elected concurrently by those desiring laboratory. Introduction to the fundamentals of physical chemistry with application to biological systems. Not accepted for credit toward a degree in chemistry, chemical technology or chemical engineering.

495. Undergraduate Research.  
(0-6 or 9) Cr. 2 or 3 each time taken.  
Prerequisite: 323, and permission of staff member with whom student proposes to work. B average in all previous chemistry, physics and mathematics courses, or in exceptional cases permission of the respective instructors in Chemistry and Physics. Literature survey and research under senior staff guidance.

510. Literature survey and research under senior staff guidance. Literature survey and survey reports. Guidance and practice in the use of chemical literature (may include some research).  
F. Research.  
No report S.  
This course should be elected for three consecutive quarters just preceding graduation.

529. Laboratory in Radium Tracer Techniques. (0-6) Cr. 2. W.S. Prerequisite: 425. Mr. Voigt. Training in measuring of radioactive substances and in their handling through chemical and biological experiments.

530. Qualitative Organic Analysis. (1-0) Cr. 3. F. Requirements: 587, 526, 286 or 386. 587 or 583. Advanced Organic Chemistry. (2-0) Jr. Cr. 2 each. Prerequisite: 223 or 326, 286 or 386, 501 recommended. 582. Organic reaction mechanisms. 583. Organometallics. 584. Stereochemistry.

531. Quantitative Organic Analysis. (1-3 to 9) Cr. 2 to 4. W.S. Prerequisite: 228 or 328. FaBBel, Rundle. Titrimetric and manometric methods of analysis emphasizing specific functional reactivity. Includes organic process control and optional laboratory work in small scale preparations.

532. Advanced Organic Laboratory. (0-3 or more) Cr. 1 or more each time elected. F.W.S. Prerequisite: 236 or 396. FaBBel, Rundle. Preparation of research work in synthesis and study of reactions of compounds of theoretical and industrial importance.

533. Food Technology. 547. Each. 546, 549. See Bacteriology.

551. Physical Metallurgy. (2-6) or 4. F. Prerequisite: 223 or 326 or permission of instructor. Mr. Chiotti. Crystalline nature, plastic properties of metals and alloys, binary equilibrium diagrams, solid state transformations with emphasis on iron and steel; experiments and discussions on metallurgical techniques and laboratory practices.

552. Introduction to Theoretical Metallurgy. (3-8) Cr. 4. Alt. W. Offered 1958. Prerequisite: 551 or permission of instructor. Mr. Chiotti. Correlation of electron free theory, zone theory, transformation mechanisms and magnetism. Experiments and discussions on special techniques used to study metal systems.

Courses for Graduate Students

601. Selected Topics in Inorganic Chemistry. (2-0) Cr. 2 each time elected. F.W.S. Prerequisite: 203, 223, Messrs. Brown, Corbett, Martin, S-baefeer. A series of one-term courses chosen from such topics as structure of matter, valency, catalysis, radiation, hybrids, and chemical reactions.

611. Seminar in Analytical Chemistry. (1-0) Cr. 1 each time elected. F.W.S. Prerequisite: permission of instructor. Messrs. Banks, Diehl, Fassel, Fritz, Goetz.


558. Thermodynamics of Metals. (3-0) Cr. 3. Alt. S. Offered 1958. Prerequisite: 552 or permission of instructor. Mr. Chiotti. Liquid, solid, vapor equilibria involving refractories, slags, metals and alloys; phase diagram and ternary phase diagrams; determination of phase fields by a.m.f. measurements.

554. Special Topics in Physical Metallurgy. (2 or 3-0) Cr. 2 or 3. F.W.S. Prerequisite: 228 or permission of instructor. Physical chemistry applied to metallurgy. A series of one-term courses chosen from such topics as X-ray metallurgy, advanced theory and ternary phase diagrams, plastic and elastic properties of metals, dislocation theory, and nature of metals.


565. Special Topics in Textile Chemistry. (1-0 to 12) Cr. 1 to 5. F.W.S. Prerequisite: 466. Miss Edgar. Problems in reaction of fibers. Offered in Biochemistry. (0-6) Cr. 2 each time taken. W.S.S.S. To accompany 574, 575.

574. General Biochemistry. (3-8) or 5. W.S. Prerequisite: 222, 225 or 483 and 286, 385 or 473 and a course in quantitative analysis. 483 is an acceptable prerequisite only if the student enrolls in 484 each time taken with 574.

575. Intermediary Metabolism. (3-8) or 6. F. Prerequisite: 574 or permission of instructor. Intermediary metabolism, and the action of enzymes on vitamins, hormones and inorganic elements.

586. Biochemical Laboratory. Credit as arranged. Yr. Cooperative development of research problems in biochemistry and related fields including research involving radioactive tracers.

591. Theoretical Atomic and Molecular Structure. (2-0) Cr. 2. F. Messrs. Bartell, Rundle.

594. Experimental Atomic and Molecular Structure. (2-0) Cr. 2. S. Messrs. Bartell, Rundle.

622. Quantum Chemistry. (3-0) Cr. 3 each time taken. Alt. F.W.S. Not Offered 1957-58. Prerequisite: Permission of instructor. Mr. Ruedenberg. Discussion of the Schrodinger equation, solution in simple cases, perturbation and variation methods. Einstein's treatment of complex atoms and molecules. Valence bond and molecular orbital methods; applications.


625. Special Topics in Physical Chemistry. (2 or 3-0) Cr. 2 each time elected. F.W.S. Prerequisite: 521, 591 or permission of instructor.
A series of one-term courses chosen from such topics as atomic, molecular and nuclear structure, surface chemistry, photochemistry, chemical kinetics, electrochemistry, phase rule.

628. X-Ray Crystal Structure (Phys. 628) (3-0) Cr. 2 each time taken. F.W.S. Offered on request.Must be started in fall.
Prerequisite: Permission of instructor.
Mr. Kidell.
Lattices and symmetry properties of crystals; diffraction of X-rays by crystals; intensities of diffracted beams; application of Fourier method; examples of structures deduced from X-ray investigations.

Prerequisite: 591. Mr. Duke.
Theory of rate processes; application of kinetics to the study of inorganic reaction mechanisms.

633. Special Topics in Organometallic Chemistry (2-0) Cr. 2. Alt. S.
Prerequisite: 590, reading knowledge of German. Mr. Gilman.

Prerequisite: 591, or permission of instructor. Messrs. DePuy, Hammond.
638. Application of structural theory to organic molecules.
639. Reaction mechanisms with emphasis on kinetic methods.

638. Chemistry of Natural Products (2-0) Cr. 2. F.S.
Prerequisite: 598 or 599 or permission of instructor. Mr. Wenkert.
Discussion of special topics in the chemistry of naturally occurring substances; degradation and synthesis of alkaloids, terpenes, steroids, antibiotics.


651. Metallurgy Seminar.
Credit as arranged. F.W.S.

672. Seminar in Biochemistry (1-0 or more) Cr. 1 or more each time elected. F.W.S.
Prerequisite: Permission of instructor.

673. Lipid Chemistry (D.F.I. 673) (3-0) Cr. 3.
Offered fall quarter 1958 and alternate years subsequently.
Prerequisite: Chem. 574 or permission of instructor.
The chemistry of fatty acids, glycerides, complex lipids, waxes, sterols, and minor lipids.

674. Protein Chemistry (8-0) Cr. 3. S.
Prerequisite: 328 or 434 or permission of instructor.
Chemistry of amino acids, peptides, and proteins.

675. Carbohydrate Chemistry (8-0) Cr. 3. SS.
Prerequisite: Permission of instructor. Mr. French.
Chemical behavior and enzymic relationships of the sugars and polysaccharides.

676. Special Topics in Biochemistry (2-0) Cr. 2 each time elected. S.
Prerequisite: Permission of instructor. A series of one-term courses covering such topics as enzymes, hormones, lipids, nucleic acids, immunology and biochemical methods.

677. Vitamins and Minerals (2-0) Cr. 2. W.
Prerequisite: 575. Mr. Metzler.
Special topics in the chemistry and enzymic functions of the vitamins and minerals.


685. Research.

CHILD DEVELOPMENT

GLENN R. HAWKES, Ph.D., Head of Department

PROFESSORS: Edith M. Sunderlin, M.A.; Lydia V. Swanson, M.S.; Thomas F. Vance, Ph.D.

ASSOCIATE PROFESSORS: D. Bruce Gardner, Ph.D.; Damaris Pease, Ph.D.

ASSISTANT PROFESSORS: Jean Lee Hansen, M.S.; Ruth E. Littlefield, M.S.; Buena M. Mockmore, M.S.

INSTRUCTORS: Martha P. Collins, M.S.; Iris Franks Henderson, M.S.; Grace E. Howell, M.S.; Bettye L. Marchant, M.S.; Monna J. Schaper, M.S.; Helen A. Tedford, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in child development leading to the degree of Bachelor of Science, see page 83.

The child development curriculum provides specialized training for professional work with children and families in connection with nursery schools, hospital recreation programs, settlement houses, welfare agencies and in recreational programs for older children, such as Girl Scouts, Campfire Girls or youth programs of the Extension Service. Opportunities to observe and work with infants, preschool and school age children are offered.

A special curriculum for a specific program involving children and families may be arranged in consultation with the head of the department.
Students wishing to combine preparation for work in television with this curriculum should plan for more than twelve quarters of study. They should consult with their adviser and the Coordinator of Radio and Television Education in the selection of at least 18 credits from the following courses: TV Workshop, Sci. 205; A.A. 241, 242; E.E. 315; Arch. 214, 217; H.Eq. 315; Music 144, 344; Sp. 301, 302, 307, 328; T.JL 475 or Engl. 315; T.JI. 317, 325, 326, 476; TV Laboratory, Sci. 206, 405.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in child development, and minor work to students taking major work in other departments. Students taking major work in child development will usually select their minors in home economics education, home management, psychology or sociology.

It is recommended that the student have a general background in home economics, but students with undergraduate training in psychology or sociology may be accepted.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only: 419, 466, 467, 480, 481.

Courses Primarily for Undergraduate Students

238. Principles of Child Development. (3-3) Cr. 3. S.
Prerequisite: Psych. 104.
Principles of development and guidance of children as applied in home situations. Observation and participation in the nursery school and other situations involving children.

240. Literature for Children. (9-0) Cr. 8. W.S.
Prerequisite: 236.
Basic stories, poetry and verse for children from two to twelve years of age.

270. Family Development: The Individual and His Family. (3-0) Cr. 8. F.W.S.
Prerequisite: Psych. 104 and Soc. 134.
Interrelations of the individual and his family through the various stages of the family's life cycle.


336. Development in Early Childhood. (8-0) Cr. 8. F.W.
Prerequisite: 259 or 270.
Social, emotional, motor and intellectual development of children to five years.

366. Play and Play Materials. (8-0 or 3) Cr. 8 or 4. W.S.
Prerequisite: Credit or classification in 336.
Principles underlying the selection of play materials and activities for children to 12 years of age.

368. Study Tour Required. Prerequisite: Credit or classification in 366.
Visit and study varied types of children and family centers, institutions and agencies.

Courses for Advanced Undergraduate and Graduate Students

538. Development in Later Childhood. (2-3) Cr. 8. W.
Prerequisite: 336. Mr. Hawkes
Social, emotional, motor and intellectual development of children from five to twelve years of age.

546. Community Factors in Development of Children and Families. (2-3) Cr. S. F.
Prerequisite: 9 credits in child development.
Resources of the community as they relate to the welfare of the child and his family. Field trips to acquaint students with community agencies.

419. Families and the Professional Person. (Soc. 419) See Sociology.

465. Seminar. (2-2) Or. 2. F.W.S.
Prerequisite: 366 and senior classification.
Preparation and presentation of reports on original investigations in child development.

466. Methods of Nursery Education. (3-3) Cr. 4. F.S.
Prerequisite: 366.
Curricula planning for the nursery school, including home-school relations. Observation of nursery school teaching.

467. Supervised Teaching in the Nursery School. (2-3) Or. 7. F.W.S.
Prerequisite: 466.
Experience in teaching a group of nursery school children for a period of six weeks.

468. Administration of Programs for Young Children. (2-3) Or. 8. W.S.
Prerequisite: Credit or classification in 466.
Essential procedures in nursery school organization including housing, equipment, health protection and supervision. Field trips to selected children's centers.

480. Guidance in Later Childhood. (2-3) Cr. 3. F.W.S.
Prerequisite: 256, 270.
Developmental characteristics of children from five to twelve years of age, with implications for guidance.

481. Group Work with Children. (2-3) Or. 8. F.
Prerequisite: 9 credits in child development and psychology.
Observation and participation in group activities of children of various ages.

555. Special Topics. F.W.S.
Prerequisite: 12 credits in child development and permission of head of department.
A. Child Development. Mr. Hawkes, Miss Swanson, Mr. Vance
B. Family Relationships. Mr. Hawkes, C. Nursery Education. Miss Swanson

567. Development in Infancy. (3-0) Or. 3. F.S.S.
Prerequisite: 9 credits in child development and psychology.
Developmental characteristics during the first eighteen months with implications for guidance and care.
Courses for Graduate Students

620. Developmental Appraisal of the Child. (3-0) Cr. 3. S.
Prerequisite: 536, 546. Psych. 434, Zool. 426. Mr. Hawkes
Analysis of methods in the clinical and experimental appraisal of children.

655. Planning College Courses in Child Development. (3-0) Cr. 3. S.
Prerequisite: 660.
Selection, organization, presentation of subject matter.

660. History and Philosophy of Child Development. (3-0) Cr. 3. F.
Prerequisite: Permission of the head of the department.

665. Seminar. Credit as arranged. F.W.B.
Miss Swanson, Messrs. Hawkes, Vance
Theories of early childhood education; history of the nursery school movement.

668. Administration of Child Study Laboratories. (2-0) Cr. 2. W.
Prerequisite: 660. Miss Swanson
Plant, equipment, staff, budget and public relations of laboratories for study of infants, pre-school and older children.

670. Dynamics of Parent-Child Relationships. (2-0) Cr. 2. W.
Prerequisite: 15 credits of child development and psychology. Mr. Hawkes
Current theories of parent-child relations.

CIVIL ENGINEERING

LOWELL O. STEWART, M.S., C.E., Head of Department


ASSOCIATE PROFESSORS: Wilfred T. Hosmer, M.S.; Rudolph J. Lubsen, M.S.; Herbert O. Ustrud, M.S.

ASSISTANT PROFESSORS: John L. Cleasby, M.S.; Hon-pong Fung, Ph.D.; Richard L. Handy, Ph.D.; Paul E. Morgan, M.S.; Robert M. Nady, M.S.; Joseph H. Semne, Jr., M.S.; John B. Sheeler, Ph.D.

INSTRUCTORS: Howard P. Harrenstien, M.S.; James M. Hoover, M.S.; Don A. Linger, M.S.; Jack L. Mickle, M.S.; Lawrence K. Sieck, M.S.; David A. VanHorn, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in civil engineering leading to the degree of Bachelor of Science, see page 73.

Civil engineering consists of the economic application of the laws, forces, and materials of nature to the design, construction, maintenance and operation of public works; also the research, testing, sales, management, and other functions that are related thereto. The public works include transportation; bridges and buildings; water supply, sewerage, irrigation, and drainage systems; river and harbor improvements; dams and reservoirs; surveys and maps.

Work on the campus is supplemented by a six-weeks summer camp which follows the sophomore year, and by inspection trips which furnish an opportunity for first-hand study of engineering work and industrial plants.

Opportunities for Graduate Study

The department offers work for the degree of Master of Science in sanitary, structural, municipal, highway, soil, and transportation engineering; and major work for the degree of Doctor of Philosophy in structural, sanitary, soil, and highway engineering; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in civil engineering at this institution, and including undergraduate courses necessary for the particular field chosen.

Students who major in civil engineering will usually select minor work from the departments of mathematics, physics, chemistry, bacteriology, geology, economics, or other engineering departments.

Open to graduate students for minor only: 335, 340, 352, 353, 355, 360, 404, 406, 422, 423, 437, 438, 439, 485.
Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Required. S. Discussion of various phases of civil engineering, supervised by staff members and practicing civil engineers.

211. Elementary Surveying. (0-9) Cr. 3. F. Prerequisite: Math. 102.
Theory and practice in use of tape, compass, level, and transit for surveying problems; topographic surveys by transit stadia.

212. Topographic and Cadastral Surveying. (1-6) Cr. 3. F. Prerequisite: 211.
Mapping from stadia and aerial surveys; areas, volumes, simple curve problems; land surveying. Elementary photogrammetry.

218. Route and Higher Surveying. (0-9) Cr. 3. S. Prerequisite: 212.
Theory and field practice in curve, spiral, and earthwork problems; field astronomy; underground, hydrographic, geodetic, and city surveys.

300. Summer Camp. Cr. 0. SS. Prerequisite: 218.
Engineering field practice in camp. Land, topographic, route, and hydrographic surveying. The student pays his own transportation expenses and the regular summer quarter registration fee.

310. Elementary Surveying and Map Making. (2-9) Cr. 5. F. Prerequisite: Math. 102.
Theory and practice in use of tape, compass, level, and transit for surveying problems; topographic surveys by transit stadia; map making; U. S. public land surveys.

313. Surveying. (1-6) Cr. 3. S. Prerequisite: 310.
Triangulation, plane-table, route surveys, field astronomy, geodetic, and city surveys.

325. Surveying. (1-6) Cr. 3. F.S. Prerequisite: Math. 102.
Pacing, chaining, leveling, traversing, simple topography, care and use of instruments. Designed for students who take no sequence courses in surveying.

335. Elements of Structures. (3-6) Cr. 5. F.S. Prerequisite: T.A.M. 224, 854, and credit or classification in T.A.M. 327 or 327.
Analysis and design of the elements of statically determinate structures of steel and timber. Influence lines for simple beams and trusses.

340. Hydrology. (2-3) Cr. 3. S. Prerequisite: Credit or classification in T.A.M. 378.
Elements of hydrology, precipitation, water losses and stream flow.

352. Planning of Transportation Facilities. (8-0) Cr. 3. F.W. Prerequisite: 215.

353. Designing Transportation Facilities. (8-9) Cr. 4. W.S. Prerequisite: 352.
Location and geometric design of highway and railway facilities. Earthwork and drainage relative to highway, railway and airport design. Right of way acquisition and final plans and specifications.

354. Roads and Pavements. (3-0) Cr. 3. F. Prerequisite: 215 or 235.
Types of roads and pavements; methods of design, construction, maintenance, special machinery, costs, comparisons, financial accounting.

355. Design of Pavements. (2-6) Cr. 4. F.S. Prerequisite: 353, 360.
Theory and practice in design, construction, and maintenance of low cost, intermediate, and high type highway and airport pavements. Stabilization of bases and pavements. Laboratory tests of aggregates, bituminous materials, and portland cement concrete and bituminous pavements.

380. Soil Engineering. (8-6) Cr. 5. W.S. Prerequisite: Classification in T.A.M. 324, Geol. 874.
Origin, structure, identification, and classification of soils for engineering purposes. Exploration and application of their physical properties. Elementary hydromechanics of soils and principles of bearing resistance, deformation characteristics, consolidation, and compaction.

394, 395. Technical Development. Required. F.S.
Oral reports and discussions on engineering organizations, technical societies, government bureaus, notable engineering achievements.

400. Senior Inspection Trip. Required. F. Prerequisite: Senior O.E. classification.
An inspection trip of one week to Oicago, St. Louis or other suitable place.

404. Engineering in City Planning. (3-6) Cr. 3. W. Prerequisite: Classification in L.A. 401 or senior engineering classification.
Relation of sanitary works, transportation, and other utilities to city planning; housing, building codes, real estate subdivision, land titles.

406. Aerial Photogrammetry. (1-6) Cr. 3. W. Prerequisite: 212 or 310.
Mapping by use of aerial photographs. Preparation of map and controlled mosaic from photographs of an area near campus.

422. Sewerage and Sewage Treatment. (2-6) Cr. 4. W. Prerequisite: T.A.M. 378, Bact. 804D, 404.
Basic design of sanitary, storm and combined sewers. Relationship of sewage treatment to stream pollution abatement. Principles of sewage treatment plant design and construction.

Collection, treatment and distribution of water for public, domestic, and industrial purposes. Design of water supply works.

487. Reinforced Concrete Structures. (3-6) Cr. 5. F.W. Prerequisite: 336.

488. Statically Indeterminate Structures I. (3-0) Cr. 3. W.S. Prerequisite: 437.
Analysis of continuous beams, rigid frames and arches. Design of a continuous girders and an industrial building.

489. Statically Indeterminate Structures II. (3-6) Cr. 5. S.F. Prerequisite: 488.
Analysis of statically indeterminate truss structures, design of a multistory building frame and a truss bridge.

448. Advanced Structures. (8-0) Cr. 3. W.
Prerequisite: Credit or classification in 438. Selected topics from prestressed concrete, ultimate theory of reinforced concrete, limit design, space frames, modal analysis, slope deflection, column analysis, etc. Design of rigid frame structure.

449. Structural Projects. (3-0) Cr. 3. S.
Prerequisite: Credit or classification in 438. Structural planning and designing of engineering projects, such as buildings and bridges.

455. Engineering Construction. (8-3) Cr. 4. F.W.
Prerequisite: 388. Fundamentals of successful construction management; construction methods and equipment, form design, estimating, inspection trips to local projects. Engineering inspection, and direction of contract work.

490. Advanced Civil Engineering. (By Conf.) Cr. 3 to 6. F.W.S.
Prerequisite: Permission of instructor. Any phase of civil engineering in which the student has done exceptionally strong work.

497. Professional Development. Required. F.W. Biographical sketches of prominent engineers; ethics; registration; professional organizations.

Courses for Advanced Undergraduate and Graduate Students

505. Public Works Engineering. (3-0) Cr. 3. S.
Prerequisite: 422 or 423. Mr. Stewart Job classification and specification; construction contracts and specifications; unit price special assessments; building codes; fire protection; refuse collection and disposal; street and work maintenance; subdivision design and layout.

521. Field Hydrology. (2-3 to 12) Cr. 3 to 6. F.
Prerequisite: 340. Mr. Baumann Field observations of precipitation, water losses and stream flow. Use of statistical methods in field.

523. Sewage Analysis and Special Problems. (2-3 to 12) Cr. 3 to 6. F.S.
Prerequisite: 422. Mr. Baumann Sewage and industrial waste chemical analysis. Experiments on sludge digestion and filtration.

525. Water Analysis and Water Treatment Plant Design. (2-3 to 12) Cr. 3 to 6. W.
Prerequisite: 425. Mr. Baumann Quantitative determination of minerals and gases in water and design of appropriate treatment works.

524. Multiple Use of Water Resources. (2-3 to 12) Cr. 3 to 6. W.
Prerequisite: 340. Mr. Baumann Social and economic phases of governmental participation in Federal Public Works programs related to the field of hydrology. Project study with reference to power, irrigation, navigation and flood control.

550. Industrial Buildings. (2-3) Cr. 3. W.

551. Multistory Buildings. (2-3) Cr. 3. S.

554. Rigid Frames. (2-3) Cr. 3. F.
Prerequisite: 438. Messrs. Gaughety, Hulasos Rigid frame analysis based upon curved beam theory, slope deflection, moment distribution, column analogy, strain energy and Beggs model method.

556. Bridge Design. (2-3) Cr. 3. S.
Prerequisite: 438. Messrs. Gaughety, Hulasos The bridge as a unit in a transportation system. Clearance requirements for traffic. Economic principles governing the design and relationship of trusses, girders, floors, and bracing. Advantages and limitations of continuous structures.
Factors influencing location, design; soil engineering, runways, design, construction, maintenance of airports, layout of field lighting plans, terminal facilities, hangars, and accessory structures. Finance, taxation, and zoning problems.

565. **Highway Construction Methods.**

(2-2) Cr. 3. S.

*Prerequisite:* 555, 485. Mr. Csanyi

Methods and equipment used in processing materials and constructing highways and their appurtenances; scheduling and controlling operations; compliance with specifications.

Courses for Graduate Students

606. **Municipal Management.** Cr. 3 to 6. F.

Mr. Stewart

Utility management, planning improvements, sources of funds, labor relations, public relations, coordination of departments.

620. **Seminar.** Required. Mr. Stewart.

621. **Sanitary Engineering and the Public Health.** Cr. 4. F.

Mr. Baumann

The sanitary engineer's responsibility in the field of public health and hygiene. Organization, administration, and operation of public health agencies.

622. **Modern Trends in Sewerage.**

Cr. 3 to 6. W. Mr. Baumann

Application of basic principles in design of sewers and treatment works. Critical analysis of existing plants.

623. **Modern Trends in Water Supply.**

Cr. 3 to 6. S. Mr. Baumann

Application of basic principles in design of water collection, treatment, and distribution systems. Critical analysis of existing plants.

636. **Load and Stress Distribution in Structures.**

Cr. 3 to 6. W. Mr. Caughey

Relation between actual and specified loads, including impact. Transfer of loads from points of application to the foundation. Distribution of stresses within and at the foundation. Principles of designing to insure a favorable stress condition. Limit design.

643. **Concrete and Block Pavements.**

(3-0) Cr. 3. F.

*Prerequisite:* 550. Mr. Csanyi

Analysis of problems encountered in the use and maintenance of concrete and pavement materials. Brick and other block paving materials.

644. **Space Frames.** Cr. 3 to 6. F.W.S.

Mr. Hulsoe

Analysis of complete structures in three planes including the continuous-frame and the truss-frame types. Interpretation of load strain and displacement measurements.

645. **Foundation Slabs.** Cr. 3. F.W.S.

*Prerequisite:* 648 or permission of instructor. Mr. Spangler

Analysis of stresses in highway pavements under various subgrade conditions. Interpretation of behavior of slabs in laboratory and in service.

646. **Dynamic Analysis of Structures.**

Cr. 3 to 6. F.W.S. Mr. Hulsoe

Theoretical and experimental studies of the dynamic effects upon structures caused by machines, vehicles, impact loads, wind, and earthquake.

652. **Bituminous Pavement Design.**

(3-3) Cr. 4. W.

*Prerequisite:* 552. Mr. Csanyi

Theory and practice in design and manufacture of bituminous paving mixtures and construction of bituminous pave-ments. Laboratory tests for design and their correlation to service behavior.

653. **Street and Urban Highway Design.**

Cr. 3. W.

*Prerequisite:* 550. Mr. Csanyi

Route selection, geometric design, economic aspects, traffic capacity, and roadway appurtenances of non-urban roads and highways.

655. **Highway Administration and Finance.**

Cr. 3. W.

Organization and function of highway department's administrative procedures; financial plans, revenues, budgets and controls; sources of revenue.

660. **Foundations and Underground Structures.**

Cr. 3. S.

*Prerequisite:* 560. Messrs. Caughey, Davidson, Spangler

Design of substructures to meet various soil conditions. Piles and pile driving. Settlement of structures. Theory of loads and supporting strengths of sewers, water mains, gas lines, culverts, tunnels. Pressures on retaining walls and open cut tunnels.

661. **Highway Soil Engineering.** Cr. 3. S.

*Prerequisite:* 560. Messrs. Davidson, Spangler


663. **Earth Dams.**

(3-0) Cr. 3. W.

*Prerequisite:* 560. Messrs. Davidson, Spangler

Location, selection of material, design and construction of earth dams.

664. **Soil Stabilization.**

(3-0) Cr. 3 each. Yr.

*Prerequisite:* 560. Messrs. Davidson, Hand.

Fundamental concepts of the nature and properties of engineering soils. Applications of principles of soil mechanics, soil physics, soil chemistry, mineralogy and physicochemical reactions between soils and soil additives to the stabilization of civil engineering structures.

668. **Planning Highway Transportation Systems.**

Cr. 3.

*Prerequisite:* 550. Mr. Csanyi

Fundamentals and coordination of transportation systems. Regional planning, planning surveys, designation of road and street systems. Mass transportation and location and type of urban facilities.
671, 672, 673. Theory of Structural Design and Analysis. (3-0) Or. 3 each. Yr.
Theories of structural action and their application to the design of bridges, building frames, rigid frames, pavement slabs, shells, floor slabs, arches and aircraft. Classical and modern methods of analysis, including formalized procedures and methods of successive approximation.

690. Research. Mesra. Baumann, Caughey, Csanyi, Davidson, Handy, Hulebo, Spangler, Stewart

CLIMATOLOGY AND METEOREOLOGY

Opportunities for Undergraduate Study
The following specific courses in Climatology and Meteorology are available to undergraduate students: Agron. 206, Phys. 305, 306, 341, 342 and 343. Related and supporting work is offered in the departments of Physics, Agronomy, Statistics, Botany, and Mathematics. A program of study in Physics, Mathematics, and Meteorology is available for those who wish to do graduate work at colleges which offer advanced degrees in Meteorology. An undergraduate minor is available but not a major.

Opportunities for Graduate Study
Graduate study in the field of meteorology is administered by the department of Physics, whereas graduate study in agricultural climatology is administered by the department of Agronomy.

Students taking work toward the M.S. or Ph.D. degree in physics may specialize in meteorology. It is expected that the work will be directed toward micrometeorology, including meteorological instrumentation.

Prerequisite to graduate work in physics (meteorology) is the satisfactory completion of a suitable undergraduate curriculum, including five quarters of college mathematics through differential and integral calculus; three quarters of college physics based upon a year of college mathematics; three quarters of chemistry; three quarters of meteorology, including physical meteorology with laboratory work in map and chart analysis, and dynamic meteorology (Phys. 341, 342, 343). Also desirable are courses in statistics and differential equations and elementary courses in geology, climatology and hydrology.

The M.S. degree is offered in agricultural climatology. Graduate students working toward the Ph.D. degree in agronomy may specialize in agricultural climatology. Supporting work will usually be taken in physics, statistics and botany.

Prerequisite to graduate work in the field of agricultural climatology is the completion of five quarters of college mathematics, through differential and integral calculus, two quarters of college physics, elementary courses in statistics, meteorology and botany and the following courses in agronomy: 114, 154, 214, 354, 464.

DAIRY HUSBANDRY

For description of courses, see Department of Animal Husbandry, page 123.

DAIRY AND FOOD INDUSTRIES

CARROLD A. IVerson, D.Sc., Head of Department


ASSISTANT PROFESSORS: Darrell D. Deane, Ph.D.; Earl G. Hammond, Ph.D.; Homer W. Walker, Ph.D.; Earl O. Wright, M.S.

INSTRUCTORS: Robert W. Baughman, M.S.; Jon R. Magnusson, B.S.

Opportunities for Undergraduate Study
There is an increasing demand for students trained at the bachelor's degree level for positions in processing, packaging, quality control, sanitation control and marketing of dairy and food products. Curricula are offered in both Dairy Industry (see page 47) and Food Industries (see page 48). The dairy industry curriculum includes options in dairy industry and chemistry and in dairy industry and economics.


Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in Dairy Industry, including dairy plant management, dairy bacteriology, dairy chemistry and the manufacture of dairy products; major work for the degree of Doctor of Philosophy in dairy bacteriology and dairy chemistry, in cooperation with basic science departments, and minor work to students taking major work in other departments.

Students in food industries contemplating graduate work in food technology should elect work in mathematics and physical and biological science sufficient to meet the standards for undergraduate preparation described on page ...

Open to graduate students for minor only: 304, 305, 306, 347, 348, 349, 350, 404, 413, 414, 450, 458.

Courses Primarily for Undergraduate Students

110. Technical Lectures. (1-0) Required. F. Field of dairy and food industry, its opportunities, requirements, and organization.

114. Elements of Dairy and Food Industries. (3-8) Cr. 4. F.W.S. Development and organization of the dairy and food industries methods of processing dairy and food products, and quality control of these products.

116. Testing and Inspection of Milk and Its Products. (3-0 or 5) Or. 3 or 5. W. Prerequisite: 114. Tests for fat, solids, acidity preservatives used in dairy plant and milk control laboratory use of Holjnnier tester.


158. Testing Milk and Milk Products. (2-6) Or. 4. F. Composition of milk. Babcock test and various other tests used in dairy manufacturing plants.

157. Butter Manufacture. (3-8) Or. 5. W. Quality of milk and cream, separation of milk, cream ripening, starting, churning, and preparing butter for market.

158. Ice Cream and Ices. (3-8) Or. 5. W. Selection and preparation of materials, processing and merchandising of plain and fancy ice creams and related products.

159. Cheese Manufacture. (3-8) Cr. 5. W. Principles of cheese manufacture. Soft cheese, cheddar, and other cured cheese; manufacture, curing, and marketing.

207. Judging Dairy Products. (0-3) Or. 1. W. Milk, cheese, butter, and ice cream.

215. Cheese Manufacture. (3-0) Or. 3. S. Prerequisite: 114. Selection of milk: manufacture and curing raw and pasteurized milk cheddar; cream. Neufchatel, and cottage; marketing.

256. Market Milk. (3-8) Or. 5. F. Methods used in preparation of milk and cream for market.

258. Condensed and Powdered Milk. (3-3) Cr. 4. W. Manufacture of condensed and powdered milk.

260. Dairy Plant Management. (4-8) Or. 6. W. Underlying principles of management of creameries and other dairy plants.

264. Special Projects. (2-0) Or. 2. F. Use of original sources of dairy information, written and oral reports, laboratory practice.


*269. Dairy Machinery. (2-8) Cr. 3. F. Construction and operation of steam boilers and engines, refrigerating machines, power transmissions; pipe fitting and soldering.

304. Manufacture of Butter. (3-8) Or. 5. W. Prerequisite: 116, 850 concurrently. Separation of milk for buttermaking, preparation of starters, ripening, and churning of cream.

305. Market Milk. (3-8) Or. 3 or 5. S. Prerequisite: 116, 850. Sanitary production and processing of milk supply; milk inspection systems and marketing of milk.

306. Manufacture of Ice Cream and Ices. (3-8) Or. 5. S. Prerequisite: 116, 850. Care and preparation of materials used. Plain and fancy ice cream and related products.

308, 809. Judging Dairy Products. (2-8) Or. 1 each. W.S. Milk, cheese, butter, and ice cream.

347, 348. Dairy Chemistry. (Chem. 847, 848) (3-8) Or. 5 each. F. 847. Prerequisite: Chem. 211, 315. Composition and changes in composition of milk in the light of milk secretion theory. The application of pH and of colloid chemistry to dairy manufacture. 848. Prerequisite: 847. Importance of milk salts, milk fat, milk fat emulsion, milk proteins and milk enzymes to the processing and keeping quality of dairy products.

349. Foods Chemistry. (Chem. 349) See Chemistry.

350. Dairy Bacteriology. (Bact. 850) (3-8) Or. 3 or 5. W. Prerequisite: Bact. 850A. Bacteria in milk and its derivatives; hygienic production and handling of dairy products.


404. Condensed Milk Products. (3-8) Or. 5. F. Prerequisite: 116. Manufacture of condensed and powdered milk, casein, and milk sugar.

405. Seminar. (2-0) Or. 2. F. Prerequisite: 850. Advanced work in dairy problems and reviews of experimental station work.

407. Special Problems in Dairy Manufacturing. (3-8 or 9) Or. 2 or 3. S. Prerequisite: Junior classification and quality point average of 2.3 or more for preceding two quarters. Advanced work related to the processing of dairy and other food products.

Courses for Graduate Students

463. Seminar in Dairy Chemistry. (Chem. 545) (1-0) Cr. 1 each time elected. E.W. Mr. Bird

465. Conference in Dairy Bacteriology. (Bact. 565) (2-0) Cr. 2. W. Mr. Nelson

459. Seminar. (1-0) Cr. 1. F. Mr. Nelson

Use of dairy literature; Methods of keeping abstract and reprint files; preparation of theses and similar technical manuscripts.

458. Milk Inspection. (Bact. 458) (2-6) Cr. 4. S.

Prerequisite: Credit or classification in 805.

Supervision of municipal milk and ice cream supplies from standpoint of sanitation.

Field trips.


454. Management of Dairy Plants. (5-0) Cr. 5. W.

Prerequisite: 804, 305, 306.

Organization, construction and operation of dairy establishments.

ECONOMICS AND SOCIOLOGY

KARL A. FOX, Ph.D., Head of Department


Opportunities for Undergraduate Study

Economics and Sociology offer a wide variety of opportunities for the individual with training in these fields; they are so broad, however, that specialization within each is often desirable. The policy of the department is to adapt the program to the needs of the student. The outline of the subfields in economics is given below. The outline for sociology is given on page 158.

I. *Agricultural Economics. Basic sequence in this field is 241, 242, 243, 307 and 308. Suggested additional courses include 304, 330, 334, 336, 405, 409, 430, 431, 435, 440, 447 and 455. I.Ad. 365, 384. Minors may be selected in conference with the adviser.

II. *Consumption Economics. The purpose of this option is to introduce to students, with a background in basic economics, the problems of income use. These problems are approached (1) by individuals and families directly; (2) by business firms and private institutions which offer goods and services to employees or to the public; (3) by governments, through policies of taxation and public expenditure. This option rests on 241, 242, in which consumption problems are introduced as a part of general theory.

Basic courses of this option are 307, 308, 415 or 515, 516, 517.

Students majoring in consumption economics usually elect at least six hours of history, six of psychology and six of sociology.

III. *General Economics. The option in general economics is designed to give the student facility in handling the principal analytical tools in the field and to acquaint him with the main areas of policy problems. Basic courses are: 241, 242, 243, 304, 305 or 307, 308, 447; 405, 409 and I.Ad. 365 are particularly recommended.

IV. Industrial Economics. Industrial economics provides broad training for students who plan to work in industry, government or education. The central emphasis is on the application of economics, as a tool of analysis and a body of knowledge, to immediate or long-run problems of industry. Undergraduates in this option usually include the following courses in their programs: A basic sequence in principles of economics followed by 304, 305, 307, 308, 405, 409, 443, 444, 445, 446, 455, and 466. Supplementary work is available in I.Ad. 384 and 463, I.E. 407, Psych. 464, Govt. 480, sociology, mathematics and statistics.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in agricultural economics, industrial economics, consumption economics and rural sociology; major work for the degree of Doctor of Philosophy in agricultural economics, consumption economics, industrial economics, and rural sociology; and minor work to students taking major work in other departments.

Prerequisite to major graduate work in the department is the completion of undergraduate work in economics, mathematics, statistics, sociology, and other social science and technical subjects, substantially equivalent to that required of undergraduate students majoring in agricultural economics, consumption economics, industrial economics, or rural sociology at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Cooperative programs of study may be arranged with the State University of Iowa College of Law, or with other recognized institutions.


*Lists of courses named herein are not to be regarded as statements of fixed requirements or as a complete outline of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.
Courses in Agricultural Economics

Courses Primarily for Undergraduate Students

110. Technical Lecture. (1-0) Required. F. Field of agricultural economics and rural sociology.

121. Agricultural Economics. (3-0) Or. 3. F.S. Role of agriculture in the American economy. Introduction to the concepts of supply and demand and the economics of production.

130. Elements of Farm Management. (3-0) Or. 4 F.W.S. A student cannot count credit for both 130 and 330 toward a degree. For students in farm operation. One all-day field trip.

130B. (3-0) Or. 3. For majors in agricultural business. W. Application of economic principles to organization and management of a farm. Budgeting, size of business, choice of enterprises, timing of production, farm labor utilization, farm layouts; leases and farm credit.

135. Agricultural Marketing. (3-0) Or. 3. S. Estimating prospective demands for farm products in relation to supplies; improving the accuracy of the system that reflects consumers' demands to producers; reducing the costs and increasing the efficiency of marketing.

190. Supervised Farm Experience. (12. 0) Or. 12. F.S. Prerequisite: 9 credits in economics. Twelve to twenty-four weeks of full-time observation and supervised experience in the employ of selected agricultural businesses. Ten credits will apply toward a B.S. degree.

266. Elements of Dairy Economics. (3-0) Or. 8. W. Open only to students in dairy plant operation program. Demand, supply and distribution of milk and dairy products; the price-making mechanism; marketing methods, grades, values, prices, costs and government legislation.

292. Marketing Business Operations. (3-2) Or. 4. S. Prerequisite: 6 credits in economics. Application of accounting and business management to the operation of agricultural marketing and purchasing plants. Use of plant records, forms and statements; merchandising, employee supervision, production plan. Visits to representative business.


330. Farm Management and Organization. (2-0) Or. 4. F.S. Prerequisite: 242. Open to students with credit in 130 only by permission of instructor. Organization and management of a farm with emphasis on use of economic principles. Enterprise selection, size of business, budgeting, leases, layout and farm analysis.

331. Farm Accounting and Business Analysis. (2-2) Or. 3. F.W. Prerequisite: 4 credits in economics. Purpose and methods of keeping farm records; accounting in accounting; income, taxes, and net worth statements; use of efficiency factors; analysis of the farm business. Field trip during one laboratory period.


336. Agricultural Co-operation. (3-0) Or. 3. F. Prerequisite: 243. General survey of co-operative activities, with special reference to agriculture; kinds of co-operatives, methods of organization and operation; principles, legal requirements; economic possibilities and limitations of co-operation.


343. Marketing Livestock and Meat. (A.H. 408) (3-0) Or. 8. S. Prerequisite: 243. The demand, supply, and distribution of livestock and meat. Analysis of changes in marketing methods; grades, values, prices, distribution. One all-day field trip.

340. Advanced Farm Organization and Management. (2-2) Or. 3. F.S. Prerequisite: 242, 330 or 130. Systems and types of farming, planning, organizations for varying soil, market, capital, tenure and conservation situations; short-run and long-run farming adjustments, two all-day field trips into Iowa type-of-farming areas.

341. Economics of Regional Farm Production. (3-0) Or. 8. W. Prerequisite: 242, 130 or 330. Theory of production location; regional production and adjustment problems in the Great Plains, Cotton Belt, Dairy Region, Corn Belt, and Pacific areas; efficiency of resource use in the agricultural industry.

342. Management of Tenant-Operated Farms. (2-0) Or. 2. F.S. Prerequisite: Senior classification and 130 or 330. Two all-day field trips. Business techniques; application of economic principles to the operation of rented farms; working relationships with farm tenants.

345. Agricultural Finance. (3-0) Or. 3. W. Prerequisite: 243. Financial requirements of individual farmers and of farm cooperative organizations. Farm credit policy. Farm Credit Administration and other lending institutions. Field trips.

346. Agricultural Marketing Analysis. (3-0) Or. 3. W. Prerequisite: 135 and 308. Analysis of demands, costs and efficiency in agricultural marketing, processing and farm supply organizations. Analysis of the marketing processes as related to agricultural commodities. Effects of industry organization and government programs.

349. Appraisal of Farm Real Estate. (2-0) Or. 3. S. Prerequisite: 243, Agron. 154. Land appraisal with emphasis on valuation procedure. Relationship of farm prices, taxes, and interest rates to value. Appraisal reports.
447. Introduction to Agricultural Policy. (3-0) Or. 3. F. 
Prerequisite: 243.
Introductory analysis of efficiency and income problems in American agriculture; description and appraisal of price support programs, conservation programs

and programs to aid low-income families.

470. Forest Economics. (For. 470) See Forestry.

490. Forest Finance. (For. 490) See Forestry.

499. Special Problems. Or. 1 to 5. F.W.S. 
Prerequisite: 243, senior classification.

Courses as Primarily for Advanced Undergraduate and Graduate Students

510. Land Use and Conservation. (3-0) Or. 3. W. 
Prerequisite: 394 or 307 or permission of instructor. Mr. Timmons

512. Agrarian Reform and Economic Development. (3-0) Or. 3. S. 
Prerequisite: 394 or 307 or permission of instructor. Mr. Timmons

534. Methodology in Agricultural Economics Research. (3-0) Or. 3. S. 
Prerequisite: 307 or equivalent. Mr. Heady
Nature of and limitations in economic analysis; means-end schemata; individual and public problems; scientific objectivity; formulation of models and hypotheses; empirical techniques; evaluation of current research procedures.

541. Agriculture in the World Economy. (3-0) Or. 3. S. 
Prerequisite: 242 or permission of instructor. Mr. Kaldor
International trade in farm products; growing industrialization and competition for world markets in farm products; policies of major food-importing nations; role of FAO and ITO.

Courses for Graduate Students

630. Advanced Land Economics. (3-0) Or. 3. F. 
Prerequisite: 307 or 394 or permission of instructor. Mr. Timmons

632. Production Planning in Marketing Firms. (3-0) Or. 3. S. 
Prerequisite: 508, 641 recommended. Mr. Shepherd
Production planning under imperfect competition; joint production and integration; application to research in agricultural marketing.

658. Agricultural Marketing and Price Policy. (3-0) Or. 3. S. 
Prerequisite: 307. Mr. Shepherd
Technical analysis of agricultural marketing; distribution, price and income policies.

684. Land Valuation. (3-0) Or. 3. S. 
Prerequisite: 307. Mr. Murray
Factors determining land value; fluctuation in land prices; critical evaluation of appraisal methods.

685. Farm Credit Theory. (3-0) Or. 3. W. 
Prerequisite: 307, 308 recommended. Mr. Murray
Farm credit policies and methods of extending credit. Organization and operation of lending agencies, private and governmental. Evaluation of alternative

agricultural credit systems.

641. Economics of Agricultural Production. (3-0) Or. 3. F. 
Prerequisite: 507. Mr. Heady
Economic principles applied to use of land, labor, and capital; static and dynamic firm theory; farm size; resource and product combinations; production location; timing of production and conservation; cost structure; leases and asset control; uncertainty and expectations.

643. Resource Efficiency and Allocation in Agriculture. (3-0) Or. 3. S. 
Prerequisite: 307, 341, 351, Mr. Heady
Efficiency criteria; inter-industry productivity comparisons; technological change; resource mobility; farm-household interrelationships; returns to farm and society; causes of and means for eliminating production inefficiency.

645. Economics of Agricultural Production Policies. (3-0) Or. 3. Alt. S. Offered 1958
Prerequisite: 507. Mr. Heady
Analysis of policies affecting efficiency of agricultural industry; emergency planning; design of policies to promote effective use of land, labor and capital resources in agriculture.

670. Advanced Forest Economics. (See Forestry.)

Courses in Consumption, General and Industrial Economics

Courses Primarily for Undergraduate Students

241, 242, 243. Principles of Economics. (8-0) Cr. 3 each. F.W.S.


804. Money and Banking. (3-0) Cr. 3. F.S.

Prerequisite: 242. Principles of money and credit; the banker-consumer relationship; contemporary banking institutions and banking practices.

305. Economics of Industrial Relations. (5-0) Cr. 3. F.W.S.

Prerequisite: 242. Economic aspects of employer and employee relations under present conditions of industry. Matters of public policy such as labor legislation and social insurance.

307. Services and Resource Allocation. (3-0) Cr. 3 each.

307. Prerequisite: 242. W.

308. Prerequisite: 307. S.

Theory of consumption and the business firm in nonperfect competition and monopolistic markets; distribution of income; general equilibrium of the pricing system.

318. Consumption Economics. (3-0) Cr. 3. S.

Prerequisite: Two quarters of economics. Consumer's choice; consumption and the market; standards of living; measurement of consumption; effects of technological change.

405. Public Finance and Fiscal Policies. (3-0) Cr. 3. S.

Prerequisite: 242. Economic aspects of public expenditures, public borrowing and taxation with special attention to incidence of taxation, debt creation and federal-state-local fiscal interrelationships.

409. National Income and Employment. (3-0) Cr. 3. F.

Prerequisite: 242 or equivalent. Business investment fluctuations and other determinants of national income and employment. Government spending, taxing and monetary policies for economic stabilization.


439. Trade Unionism. Theory and Practice. (3-0) Or. 3. F.

Prerequisite: 805. History and development of American trade unions and contemporary unions in terms of structure, function, and internal relationships. Rights and responsibilities of unionism in modern society.

444. Management. Theory and Practice. (3-0) Or. 8. F.S.

Prerequisite: 805. History of business organization; levels of organization and management structure; lines of authority and functions; formulation of policy; control techniques.


446. Public Control of Labor Relations. (3-0) Cr. 3. Alt. S. Offered 1959

Prerequisite: 445. Analysis of federal and state legislation on collective bargaining and labor relations. Emphasis on essential elements of public policy on labor relations at the federal level, particularly the practical effects of such legislation on the daily conduct of labor-management relations.

455. International Economics. (8-0) Or. 3. F.


466. Retailing. (H.Mgt. 450) (3-0) Or. 3. S.

Prerequisite: 242. Economic nature of retailing; retail market structure; store organization; merchandising and pricing policies; retail control.


499. Special Problems. Cr. 1 to 5. F.W.S.

Prerequisite: 243, senior classification.

B. Consumption Economics. O. Industrial Economics.

Courses for Advanced Undergraduate and Graduate Students

506. Fiscal and Monetary Policies. (3-0) Cr. 3. W.

Prerequisite: 242 or equivalent. Government spending and tax policy and federal reserve policies in relation to public investment, debt creation, and national income.

507. Intermediate Analysis. (3-0) Cr. each. F.W.

Prerequisite: 242, Math. 101. Mr. Nordin Analysis of production functions, behavior of firms in perfect competition, theory of consumption, concepts of optimal allocation of resources. Behavior of firms in nonperfect competition.

509. Consumption Theory. (3-0) Cr. 3. B.

Prerequisite: 242 or equivalent. Miss Hoyt Development and objectives; relationship to other types of theory and to practical problems.

515. Price and Market Analysis. (H.Mgt. 515 (3-0) Cr. 3. W.

Prerequisite: 242. Miss Douglas Objectives and methods of analyzing the structure and functioning of consumer goods markets; case studies of selected markets.

516. Standards of Living. (H.Mgt. 516) (3-0) Cr. 3. W.

517. Economics of Housing.  
(H. Mgt. 517) (3-0) Cr. 3. Alt. S. Offered 1958  
Prerequisite: 242. Miss Douglas  
Needs and standards; expenditures, costs, valuation; construction, marketing and finance; economic appraisal of public policy.

520. Food Economics.  
(H. Mgt. 520) See Home Management.  
536. Business Fluctuations.  
(3-0) Cr. 3. Alt. S. Not offered 1958  
Prerequisite: 409 or 506.  
General fluctuation, production, employment, prices, and incomes; their scale and importance; principal explanations suggested; proposed remedies.

537. Introductory Econometrics.  
(3-0) Cr. 3. F.  
Prerequisite: 307, Math. 101. Mr. Tintner  
Demand and supply functions; taxation, income distribution, cost functions, elasticity, monopoly, production theory, consumer surplus.

538. Elementary Econometric Statistics.  

(3-0) Cr. 3. W.  
Prerequisite: 307.  

Courses for Graduate Students

(3-0) Cr. 3 each. W.S.  
Prerequisite: 508. Mr. Wright  
Principal figures in the development of economic ideas; contribution of each period of economic thought.  
(605) The Mercantilists to the Classical School.  
(606) Critics of the Classical School to J. M. Keynes.

614, 615, 616. Advanced Theoretical Analysis.  
(3-0) Cr. 3 each. Yr.  
Prerequisite: 308. Messrs. Nordin, Tintner  
(614) Critical study of traditional theories of household, firm and competitive market, with attention to contemporary thought.  
(615) General equilibrium in consumption and production. Modern microeconomic theories, including monetary theories. Risk and uncertainty.  
(616) Macroeconomics; relations between monetary theory and general equilibrium theory.

(Stat. 638) See Statistics.

645. Econometrics.  
(Math. 645) (3-0) Cr. 3. Alt. S. Offered 1958  
Prerequisite: 308, Math. 213. Mr. Tintner  
Mathematical formulation and exposition of demand, laws of production, competition, monopoly, taxation, dynamic utility theory, general equilibrium theory, dynamic equilibrium theory. Econometric applications.

646. Time Series.  

688. Advanced Family Finance.  
(H. Mgt. 688) See Home Management.

699. Research.  
A. Consumption Economics.  
Messrs. Douglas, Hoyt, Liston  
B. Industrial Economics.  
Mr. Davey  
C. General Economics.  
Messrs. Nordin, Tintner, Wright

SOCIOLoGY

Opportunities for Undergraduate Study

Sociology is concerned with the nature and workings of group life. Courses are built around selected group functions, institutions, and problems with the objectives of providing (1) information gained through research about group life, (2) insight into the "why" of group behavior and (3) techniques for studying social situations and problems.

The major in sociology. Sociology as a field of concentration points toward a variety of occupational outlets among which are (1) positions in private, public welfare, and group work agencies; (2) civil service appointments with government agencies dealing with housing, labor, employment services, farm programs; (3) college and university teaching, research and extension work; (4) positions with farm organizations, churches, and other major rural groups; (5) positions with personnel departments in industry. The facilities of the College provide unusual opportunities for apprenticeship in rural organizations, social welfare, research in industrial relations and in rural research, including population, family, ethnic and intergroup relations, community, social problems, etc. Qualified students are encouraged to pursue graduate study in sociology or social work, since the more responsible positions require advanced degrees.
Undergraduate majors in this department usually have included the following basic courses in their programs: 300, 400, 406, 409, 445.

In addition to the recommended basic courses for all majors in sociology, fields of specialization are represented by the following offerings:


The minor in sociology provides a minor for those majoring in technical agricultural economics, industrial administration, psychology, technical journalism, vocational and home economics education, child development, food and nutrition, home management.

For opportunities for graduate students, see page 154.

Courses in General Sociology

Courses Primarily for Undergraduate Students

134. Introduction to Sociology. (3-0) Cr. 3. F.W.S.

Analysis of the effects of group relations on human behavior; interrelations of personality, group, community and culture; major social processes, practical study of society.

135. Social Problems. (3-0) Cr. 3. F.W.S.

Prerequisite: 134 or 200. Nature and meaning of social problems; incidence and characteristics of selected social problems of major public interest; analysis of proposed solutions.

200. Rural Institutions and Organizations. (4-0) Cr. 4. F.S.

For students in farm operation. Structure and problems of rural groups; field trips to farmer meetings; visiting lecturers; discussions by agricultural leaders.

300. Sociological Principles. (3-0) Cr. 3. F.W.

Prerequisite: 134 or 200. Introduction to advanced principles; analysis of concepts and propositions.

305. Social Interaction. (3-0) Cr. 3. F.W.

Prerequisite: 134. Dynamic of social relations; analysis of human behavior in group situations.

319. Courtship and Marriage. (C.D. 819) (5-0) Cr. 3. F.W.

Prerequisite: Sophomore standing. A person-centered analysis of courtship and marriage, including introductory examination of the family with children; contributions of the various fields of knowledge to the understanding of courtship and marital adjustment.

335. Criminology. (3-0) Cr. 3. F.

Prerequisite: 134. Extent and character of crime in rural and urban areas; treatment and care of offenders; programs for prevention. Field trips and interviews with public officials.

336. Juvenile Delinquency. (5-0) Cr. 3. W.

Prerequisite: 134. Sociological nature and extent of delinquency; administration of juvenile courts; institutional treatment; probation and parole. Field trips and interviews.

364. Group Work Techniques and Programs. (2-3) Cr. 3. S.

Prerequisite: 134 or 200. Planning and conducting group activities; utilization of group dynamics and group techniques to group productivity; laboratory, group analysis, field practices.

375. The Family in Different Cultures. (3-0) W.

Prerequisite: 134 or C.D. 270. Cross-cultural analysis of family institutions; anthropological investigation of the family as a universal system.
Courses for Advanced Undergraduate and Graduate Students

501, 502. Advanced Systematic Theory. (3-0) Cr. 3. Alt. S. Not offered 1958
Prerequisite: 800 or permission of the instructor.
The elements of systematic theory. Analysis of important theoretical works. Use of theory in research.

550. Social Disorganization. (3-0) Cr. 3. Alt. W. Not offered 1958
Prerequisite: 9 credits in sociology. Mr. Lunden
Disorganization within contemporary society; interrelatedness of social and economic and political problems; appraisal of theories for prevention and treatment.

590. History of Sociological Theory. (3-0) Cr. 3. Alt. W. Offered 1958
Prerequisite: 9 credits in sociology.

Courses for Graduate Students

660. Seminar in Sociology. Cr. 3 each time elected.
D. Social Disorganization. Alt. W. Offered 1958
E. Family. S.

Courses in Rural Sociology

Courses Primarily for Undergraduate Students

200. Rural Institutions and Organizations. (3-0) Cr. 4. F.S.
For students in farm operation. Structure and problems of rural groups; field trips to farmer meetings; visiting lecturers; discussions by agricultural leaders.

386. Sociology of Rural Life. (3-0) Cr. 3. S.
Prerequisite: 134.
Changing characteristics of rural society; human relationships, values, institutions, affected by changing population, technology and agricultural practices.

COLLEGIATE INSTRUCTION

430. Social Stratification. (3-0) Cr. 3. Alt. S. Not offered 1958
Prerequisite: 800 or permission of the instructor.
Social status and social class; analysis of stratification systems in the United States; social status and behavior differences; social mobility.

Prerequisite: 800 or permission of the instructor.
Composition and characteristics of changing population, birth rates, and mobility introduction to population theory and policy.

454. Field Observation and Practice. Cr. 1 to 3. F.W.S.
Prerequisite: 8 hours in sociology.
B. Industrial plants and related organizations.
C. Welfare and professional group work agencies.
D. Family life education and agencies. Directed analyses and supervised practice under operational conditions.

460. Field Observation and Practice. Cr. 1 to 3. F.W.S.
Prerequisite: 8 hours in sociology.
E. Family sociology. Mr. Wakeley
D. Industrial sociology. Mr. Lunden
F. Social Institutions. Mr. Fulcomer

Prerequisites:
1. Research Methods.
2. Industrial sociology.
3. Family Sociology.

464. Community Action. (3-0) Cr. 3. W.
Prerequisite: 300 or permission of instructor.
Community analysis of mobilization and organization of community resources for social action; field studies.

485. Sociology of the Family. (3-0) Cr. 3. W.
Prerequisite: 800 or permission of instructor.
Analysis of the family as a group; cultural influences, group processes and institutional aspects.

486. Leadership and Social Interaction. (3-0) Cr. 3. W.
Prerequisite: 800 or 805. Generalist of leadership; leader-follower roles and leader types in modern society; case studies and critique of contemporary theories.

488. Family Legislation. (3-0) Cr. 3. S.
Prerequisite: Six credits in sociology. Analysis of welfare legislation relating to marriage, guardianship, adoption, divorce, and dependents; legal status of husband and wife, and children. Laws relative to social security.

490. Social Case Work. (3-0) Cr. S. Prerequisite: 450. Methods and objectives of social work; case reporting and analysis. Supervised home visiting as a basis for study of case needs.

499. Special Problems. Cr. 1 to 5. E.W.S.
A. General Sociology.
B. Social Welfare.
C. Industrial Sociology.
D. Family Sociology.

Origin and development of sociological theory to the twentieth century.

590. Social Organization. (3-0) Cr. 3. Alt. W. Offered 1958
Prerequisite: 9 credits in sociology. Messrs. Lunden, Wakeley
Theories of social organization; group structure and process as frames of reference. Differentiating factors affecting the structure of society; classification of basic social forms.

592. Special Topics. Cr. 1 to 5. E.W.S.
Prerequisite: Senior or graduate classifications.
A. General Sociology. Messrs. Fulcomer, Lunden, Wakeley
B. Social Welfare. Mr. Lunden
D. Industrial Sociology. Mr. Wakeley
E. Family Sociology. Mr. Fulcomer

H. Systematic Leadership. Alt. F. Offered 1957
I. Research Methods. S.


Courses for Graduate Students

660. Seminar in Sociology. Cr. 3 each time elected.
D. Social Disorganization. Alt. W. Offered 1958
E. Family. S.

Courses in Rural Sociology

Courses Primarily for Undergraduate Students

200. Rural Institutions and Organizations. (3-0) Cr. 4. F.S.
For students in farm operation. Structure and problems of rural groups; field trips to farmer meetings; visiting lecturers; discussions by agricultural leaders.

386. Sociology of Rural Life. (3-0) Cr. S. W.
Prerequisite: 134.
Changing characteristics of rural society; human relationships, values, institutions, affected by changing population, technology and agricultural practices.

387. Farmers' Organizations. (3-0) Cr. 3. F.
Prerequisite: 134 or 200.
Organized efforts of farmers to solve major problems. Development, policies and progress of Grange, Alliance, Farmer's Union, Farm Bureau and of Extension Service and other governmental agencies. Field studies of farm organizations and meetings.

454. Field Observation and Practice. Cr. 1 to 3. F.W.S.
Prerequisite: 8 hours in sociology.
A. Rural organizations and agencies. Directed analysis and supervised practice under operational conditions.

499. Social Problems. Cr. 1 to 5. F.W.S. Prerequisite: 6 credits in sociology. B. Rural Sociology.

Course for Advanced Undergraduate and Graduate Students

599. Special Topics. Cr. 1 to 5. F.W.S. Prerequisite: Senior or graduate classification. B. Rural Sociology.

Courses for Graduate Students

660. Seminars in Sociology. (3-0) Cr. 3 each. H. History of Research in Rural Sociology. Alt. W. Offered 1968

A. Rural Community Organization. Alt. S Not offered in 1958
B. Current Rural Research. F.


Opportunities for Undergraduate Study

For undergraduate curriculum in electrical engineering leading to the degree of Bachelor of Science, see page 74.

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 mankind.

The curriculum in electrical engineering has been designed to enable the individual to develop his imagination and knowledge so that he can enter any of these fields according to his incentive, initiative and talents.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in electrical engineering, and minor work to students taking major work in other departments.

Minor work for the degree of Doctor of Philosophy will usually be selected from mathematics, physics, physical chemistry, and chemical engineering.

The department also offers major work for the degree of Master of Engineering at approved off-campus locations. Such locations require approval by the Graduate Study Committee of library, laboratory and other facilities. A minimum of eighteen credits for work taken in residence on the Iowa State College campus is required. The language and thesis requirements are the same as those for the Master of Science degree. For further information, see page 108.

Prerequisite to major graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of undergraduate students in electrical engineering at this institution. Any course will be offered in a given quarter provided there is sufficient demand.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Required. S.

Current electrical engineering thought and practice presented by staff members and visiting lecturers.

211. Fundamentals of Electrical Engineering. (3-8) Or. 4. F.

Prerequisite: Credit or classification in Math. 211.

Basic concepts of electrical engineering.

212. Electric and Magnetic Circuits. (3-6) Or. 5. W.

Prerequisite: 211.

Introduction to circuit theory.

213. Electric and Magnetic Fields. (4-5) Or. 5. S.

Prerequisite: 212, credit or classification in Math. 218, credit or classification in T.S.A.M. 274.

Introduction to field theory.

300. Seminar. (1-0) Required. S.

Prerequisite: Junior classification.

301, 302, 308. Alternating Current Circuits. (3-6) Or. 6. F.

Prerequisite: 213 and credit or classification in Math. 316.

302. (3-3) Or. 7. W.

Prerequisite: 301.

308. (3-3) Or. 4. S.

Prerequisite: 302.

Engineering methods of solution of single and polyphase circuits, wave analysis, wave filters, and network synthesis.

315. Television Fundamentals. (3-0) Or. 3. F.W.

Prerequisite: Sp. 301, and permission of instructor.


315. Television Operation Techniques. (4-3) Or. 3. S.W.

Prerequisite: 315, or permission of instructor.

Application of fundamental principles to the operation of television broadcasting equipment by laboratory training in studio operations.

*335, 336, 337. Circuits and Machines. (3-6) Or. 5. F.

Prerequisite: Phys. 219.

336. (3-3) Or. 7. W.

Prerequisite: 335.

337. (3-3) Or. 4. S.

Prerequisite: 336.

Principles of electric and magnetic circuits and of electric machines.

355. Electrical Applications in Buildings. (3-3) Or. 4.

Prerequisite: Arch. 306.

Circuit arrangements in modern buildings and characteristics of electrical equipment with special consideration to application of electric lighting.

366. Electrical Measurement. (1-5) Or. 2. S.

Prerequisite: 302.

Principles of electrical instrumentation.

374, 375. Electrom. 374. (8-9) Or. 3. W.

Prerequisite: 301, Math. 316, T.S.A.M. 844.

375. (8-9) Or. 4. S.

Prerequisite: 374.

Characteristics of high vacuum gaseous and semi-conductor electronic devices. Solution of networks containing such elements.

*335, 336, and 337 are courses designed especially for aeronautical, industrial and mechanical engineers but available to others who satisfy the prerequisites.

377. Electromechanical Devices I. (3-0) Or. 5. W.

Prerequisite: Credit or classification in 302.


378. Electromechanical Devices II. (3-3) Or. 4. S.

Prerequisite: 377.

Analysis of machine performance by the principles of electromechanical energy conversion.

400. Senior Inspection Trip. Required. F.

Prerequisite: Senior E.E. classification. Approval of instructor one week spent in industrial centers.

402. Electric Power Machinery I. (3-3) Or. 4. F.

Prerequisite: 378.

Principles of electric power machinery.

403. Electric Power Machinery II. (3-3) Or. 4. W.

Prerequisite: 402.

Advanced topics in electric power machinery.

408. Engineering Analysis. (4-0) Or. 4. W.

Prerequisite: Math. 418, and senior classification.

Principles and methods of analysis from various fields of engineering.

424. Theory of Electrical Networks. (3-3) Or. 7. F.

Prerequisite: 308.

Circuits of distributed constants, lines; Maxwell's equations.

428. Recurrent Electrical Transients. (4-0) Or. 4. W.

Prerequisite: 375, 424, Math. 418.

Response of electrical systems to repeated transients.

434. Electrical Standards Applications. (2-3) Or. 3. F.

Prerequisite: Phys. 223.

Elementary electrical principles and applications.

435*. Direct Current Circuits and Machines. (3-8) Or. 4 or 3. F.

Prerequisite: Phys. 223, Math. 215.

437**. Alternating Current Circuits and Machines. (3-8 or 4. S. W.

Prerequisite: 435.

Applications to mechanical processes; design of equipment using electronic devices.

446. Electronic Circuits and Instrumentation. (4-0) Or. 4. F.

Prerequisite: Phys. 218 or 233, Math. 215 and senior classification. Credit will not be allowed for both the 374, 375 sequence and the 445, 446 sequence.

Theory and practice in the use of electronic circuits for scientific measurement.

447, 448, 449. Radio Engineering. (3-3) Or. 4 each. F.W.

Prerequisite: 375, credit or classification in 424.

Principles of radio circuits and fields,-network analysis. Theory and design of transmission and distribution systems.

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*384 is for civil engineers.

485 and 497 are for agricultural, architectural, ceramic and chemical engineers.

*489 is designed especially for industrial and mechanical engineers but available to others who satisfy the prerequisites.
466. Power System Engineering. (4-0) Cr. 4. S.
Prerequisite: 403 and 465.
Principles of power system operation, protection and stability.

475. Industrial Electronics. (3-3) Cr. 4. F.
Prerequisite: 375, 379.
Continuation of 375, mainly in fields of control and power applications.

479. Medium Frequency Circuits. (3-3) Cr. 4.
Prerequisite: 303, 375.
For students specializing in power systems. (May not be taken for credit if a student has completed 457 and 458.)

484. U.H.F. Circuits. (3-3) Cr. 4. S.
Prerequisite: 458.
Circuits and techniques for use at ultra-high frequencies.

Courses for Advanced Undergraduate and Graduate Students

501. Circuit Analysis. (5-0) Cr. 5. F.
Prerequisite: 303, 408, Math. 316.
Analysis of lumped parameter systems including operational methods.

503. Analysis of Distributed Parameter Circuits. (5-0) Cr. 5. S.
Prerequisite: 401 and Math 816.
Operational techniques.

511. Semiconductor Devices and Their Application. (3-3 or 0) Cr. 4 or 3. F.W.S.
Prerequisite: 375 or 446.
Basic concepts of semiconductor devices. Design, analysis and application of transistor circuits.

518. Dielectric Materials. (3-0) Cr. 3. F.W.S.
Prerequisite: Permission of instructor.
Mr. Hughes
Theory of dielectrics, measuring techniques, and applications.

514. Magnetic Materials. (3-0) Cr. 3. F.W.S.
Prerequisite: Permission of instructor.
Mr. Hughes

521. 522, 523. Television Systems. (3-0) Cr. 5 each. Yr.
Prerequisite: 459 or permission of instructor.
Mr. Town
System aspects of television engineering; subjective and objective factors; television standards; colorimetry; constant luminance principle in color television; gamma correction for color; problems of encoding; television circuits.

538. Transients in Electronic Circuits. (Phys. 539) (3-3) Cr. 4. S.
Prerequisite: 375 or 446.
Credit will not be given for both 426 and 538. Electronic circuits of use in research; wave-shaping, pulses, counter circuits.

548. Engineering Acoustics. (Phys. 548) (2-3) Cr. 3. S.
Prerequisite: 375, 424. Mr. Town
Acoustical-electrical analogues and circuits. Studio acoustics; acoustical measurement.

552, 553, 558. Electromagnetic Fields. 551. (3-0) Cr. 3. F.
Prerequisite: Math. 511 and 550 or permission of instructor.
Mr. Hughes
Maxwell's equations, wave phenomena, guided wave systems.

568, 584. Engineering Acoustics. (8-0) Cr. 8. F.W.B.
Prerequisite: 448 and 551 or permission of instructor.
Mr. Hughes
Wave phenomena, guided wave systems.

553. (3-0) Cr. 3. S.
Prerequisite: 552 or permission of instructor.
Mr. Hughes
Resonant cavities, microwave networks, radiation.

575. Bervomechanisms. (3-0) Cr. 3. F.W.S.
Prerequisite: 458, 502.

593. Special Topics. Cr. 2 to 5 each time elected. F.W.S.
Prerequisite: Permission of Instructor.
Messrs. Boast, Cassell, Cooper, Hughes, Town
Formulation and solution of theoretical or practical problems connected with electrical circuits, apparatus, machines, or systems.

Courses for Graduate Students

605. Illuminating Engineering. (8-0) Cr. 3 each time elected. F.W.S.
Prerequisite: 485. Mr. Boast
Fundamental concepts, radiation sources, measurement of light, geometry of sources and receivers, transfer of flux between surfaces, advanced lighting design, color.

626. Transmission Engineering. (4-0) Cr. 4. F.W.S.
Prerequisite: 465. Mr. Boast
Transmission systems.

627. Broadcast Engineering. (3-0) Cr. 3. F.W.S.
Prerequisite: 465. Mr. Cooper
Substations, distribution systems.

628. Power System Stability. (3-0) Cr. 3. F.W.S.
Prerequisite: 626. Mr. Boast
Determination of system stability limits.

629. Power System Protection. (3-0) Cr. 3. F.W.S.
Prerequisite: 626. Mr. Boast
Theory and application of devices for protection of transmission lines; transformers, rotating machines, and other equipment.

630. A-O Network Analyzer. (1-6) Cr. 3. F.W.S.
Prerequisite: 626. Mr. Boast
Theory and applications.

648. Vacuum Electronics. (3-0) Cr. 3. F.W.S.
Prerequisite: 375. Mr. Town
Emission, space charge, applications in electronic engineering problems.

649. Gaseous Electronics. (3-0) Cr. 3. F.W.S.
Prerequisite: 375. Mr. Town
Fundamentals of gaseous conduction, gaseous discharge devices, applications in industrial electronics.

850. Advanced Laboratory. Cr. 1 to 3 each time elected. On demand.
Selected projects in area of advanced electrical study.
COLLEGIATE INSTRUCTION

660. Transient Analysis. (2-3) Cr. 3. F.W.S.
Prerequisite: 501, 661.
Transient effects in operation of electrical machines and systems.

661. Synchronous Machines.
(3-0) Cr. 3. F.W.S.
Prerequisite: 402. Mr. Coover
Windings, space and time harmonics of magnetomotive force, characteristics of salient pole and cylindrical rotor machines.

662. Transformers and Induction Machines.
(3-0) Cr. 3. F.W.S.
Prerequisite: 402. Mr. Coover
Polyphase and three-winding transformers, induction motors and generators.

663. Single-Phase and Special Machines.
(3-0) Cr. 3. F.W.S.
Prerequisite: 402. Mr. Coover
Single-phase motors, self-synchronous devices.

671. Four-Terminal Network Theory.
(3-0) Cr. 3. F.W.S.
Prerequisite: 601. Mr. Cassell
General theory of four-terminal networks, non-dissipative uniform ladder structures.

672. Driving-Point Impedances.
(3-0) Cr. 3. F.W.S.
Prerequisite: 501. Mr. Cassell
Foster's reactance theorem, extension to dissipative cases, energy functions and linear network transformations, simulative networks.

673. 674. Feedback Amplifiers.
(3-0) Cr. 3 each. F.W.S.
Prerequisite: 501. Mr. Cassell
Mathematical definition of feedback, stability, physical realizability, design.

670. Research. F.W.S.

ENGGINEERING

J. F. DOWNET SMITH, Sc.D., Dean of Engineering
J. E. LAGERSTROM, M.S., Assistant to the Dean
MERVIN S. COOVER, E.E., Administrative Assistant

LAWRENCE R. HILLYARD, M.S., Personnel Officer

PROFESSORS: Glenn Murphy, Ph.D., C.E., Morton Smutz, Ph.D., George R. Town, D.Eng.
ASSOCIATE PROFESSORS: George Burnet, Jr., Ph.D.; Robert E. Uhrig, Ph.D.
ASSISTANT PROFESSOR: R. W. Fisher, B.S.

Opportunities for Undergraduate Study

For undergraduate curricula offered in the several departments of engineering leading to the degree of Bachelor of Science, see pages 66 to 76.

The orientation courses listed are required of all freshman engineering students in order to provide information that will help the student in deciding which curriculum he will follow after the first year.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in engineering and minor work to students taking major work in other departments. The department also offers major work for the degrees of Master of Science and Doctor of Philosophy in nuclear engineering. (See Nuclear Engineering, page 210.)

Prerequisite to graduate work with a major in engineering is the completion of undergraduate work substantially equivalent to that required of undergraduate students in any engineering department at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Major and minor work for advanced degrees offered in the other departments of engineering are indicated in the descriptions of the individual departments.

Courses Primarily for Undergraduate Students

114, 115. Orientation. (1-0) Required.
(114) Nature of professional work in engineering. Methods of testing individual's aptitudes for engineering profession.

Course for Advanced Undergraduate and Graduate Students

500. Special Topics.
(2 to 5-0) Cr. 2 to 5. F.W.S.

Course for Graduate Students

600. Research. F.W.S.
Opportunities for Undergraduate Study

Adequate training in the graphical language brings to the engineer a professional literacy essential and preliminary to all engineering work. Greater emphasis is being placed upon the graphical solution of production problems involving space relationship as well as an increased recognition of the speed and accuracy of graphical methods to replace and supplement mathematical solutions of engineering problems.

In teaching the fundamentals of engineering drawing, attention is directed not alone to the technique of drawing but more upon the power to visualize. This power is developed both for reading and writing the language. The several phases of this graphical language are integrated in such a way as to produce a logical whole. Freehand sketches are employed extensively, using orthographic and pictorial methods, to teach rapid execution of shape-description problems, while complete working drawings are made to conform with accepted drafting standards in the several fields of engineering.

Engineering drawing in itself is not a profession. Nevertheless, the proficiency in its use is the gateway through which many enter the field of engineering.

Courses Primarily for Undergraduate Students

(1-6) Cr. 3. F.W.S.
Freehand lettering and sketching. Use of drawing instruments, triangles, architect's and engineer's scales, geometric curves, coordinate systems, curve plotting, equation graphs. Elementary space problems in orthographic or multiview projection of points, lines, planes and solids. Axonometric, oblique and perspective drawing.

131A. For students in architecture and architectural engineering.

132. Graphical Theory and Application.
(1-6) Cr. 3. W.S.
Prerequisite: 131.
Continuation of 131 to provide instruction in freehand and instrumental drawing involving sections, conventional practices, and basic size specifications. Determination of true distances, clearances, true angles, true sizes and shapes. Plane, single curved, double curved, and warped surfaces. Surface developments and intersections.

132A. For students in architecture and architectural engineering.

(1-6) Cr. 3. W.S.
Prerequisite: 132.
Comprehensive treatment of dimensioning and conventional representation as applied to all fields of engineering. Details, layouts, assemblies; structural, welding, piping and wiring diagrams; thread and fasteners. Specification standards, ink- ing and drafting reproduction. Introduction to graphical solutions. Mathematical equations, forces, alignment charts.

235. Advanced Graphical Problems.
(0-3 to 15) Cr. 1 to 5. S.
Prerequisite: 133 and permission of head of department.

ENGLISH AND SPEECH

FRED W. LORCH, Ph.D., Head of Department


Opportunities for Undergraduate Study

The instruction offered in English and Speech is designed to give the student a knowledge of the principles underlying effective communication through language and the opportunity for practice in the application of those principles in reading, writing, speaking, and listening.

English 101-102-103, the basic sequence required of freshmen, and Speech 311 provide instruction in fundamental principles, carefully planned to meet the student's personal and professional needs in the oral and written use of language; further skill in communication may be developed in advanced and elective courses in both English and Speech. The study of literature, in addition to developing skill in reading and affording enjoyment, serves to sharpen the student's observation of his own and others' experience and to increase his understanding of himself and the world about him.

Students preparing to teach English or Speech in the secondary schools, students in pre-law or pre-medical studies, and students with broad interests in the humanities or social science may use literature, composition, and speech as fields for a degree in General Science (see General Science, page 98). Courses in literature, composition, and speech will help to qualify the General Science major for teaching useful combinations of courses in secondary schools, and for positions requiring communications skills in the professions and business. Certain courses offered by the department will be useful for students who expect to supervise dramatic production, debate, or discussion, either in the secondary schools or in adult education.

To secure the recommendation of the department as a teacher of English in the secondary schools, the candidate is required to have a quality point average of 2.5 in 15 credits of English beyond English 103, including English 394 and 12 credits in courses chosen by the student with the approval of his classifying officer and of the head of this department. To secure the recommendation of the department as a teacher of speech in the secondary schools, the candidate is required to have a quality point average of 2.5 in 15 credits of speech, including Speech 311 (3 credits) and 12 credits chosen by the student with the approval of his classifying officer and the head of this department.

The department maintains a writing clinic for the use of sophomores, juniors, seniors, and graduate students who wish to improve their use of written English, and a speech clinic for the use of all students who wish advice on individual speech problems.

The department also offers a limited number of courses in the field of radio and television broadcasting. These are designed to give the student an understanding of the principles of broadcasting, and of radio and television speech and production.

Courses in English

Courses Primarily for Undergraduate Students

101, 102, 103. Principles of Composition. (3-0) Cr. 3 each. F.W.S. each. Application of principles governing the use of language in writing, speaking, and reading. (101) Fundamentals of correctness and clarity; adaptation of expression to specific purposes of communication. (102) Techniques of informative and persuasive writing; qualities and functions of language. (103) Narrative techniques and descriptive detail as means of communicating fact, opinion, and feeling; function of literature in stimulating observation and evaluation of experience.

205. Propaganda Analysis. Reasoning and Writing. (3-0) Cr. 3. F.W.S. Prerequisite: 102. Study of the language in which current issues are presented to the public, especially language which may arouse feeling or confuse thought. Application of basic rules of thinking to issues studied; practice in informative and persuasive writing, reading and discussion.

254. Introduction to American Literature. (3-0) Cr. 3. F.W.S. Prerequisites: 103. Study of selected works of major American writers, significant for their attitudes...
Courses in Speech

Courses Primarily for Undergraduate Students

301. Principles of Radio and Television Broadcasting. (3-0) Cr. 3. F.W.S. Prerequisite: 103.

302. Radio and Television Speech. (3-0) Cr. 3. F.W.S. Prerequisite: Speech 301 or permission of instructor.

364. Advanced Composition. F.W.S.
Prerequisite: 108.
Description and narrative techniques; emphasis on characteristic and the short story. Writing, reading, criticism.

304A. (3-0) Cr. 3.
Prerequisite: 108.
Description and narrative techniques; emphasis on characteristic and the short story. Writing, reading, criticism.

304B. (3-0) Cr. 3.
Prerequisite: 108.
Personalized exposition; personal, social, or scientific material with individualized expression.

315. Narrative and Dramatic Writing for Radio and Television. (3-0) Cr. 3. W. Prerequisite: 302 and 304 or permission of instructor.
Examination of various kinds of radio and television script forms; nomenclature of script writing; study of story sources; techniques of story development; sound and production problems related to script writing; preparation of scripts for radio and television.

344. Readings in Biography. (3-0) Cr. 3. S. Prerequisite: 108.
Selections from biography and autobiography of world's great creative workers in science, engineering, agriculture, the arts, government. Other eminent contributors to civilization. Special attention to lives of scientists and to procedures of science. Impact of great men upon their own and later times.

354. World Literature. (3-0) Cr. 3. S. Prerequisite: 103.
Masterpieces of Greek, Roman, Italian, German, and Russian literature.

356. Old Testament. (3-0) Cr. 3. W. Prerequisite: 103.
Literature of Old Testament, including narrative, poetry, wisdom literature and prophetic literature.

364. American Masterpieces. (3-0) Cr. 3. F.W.S. Prerequisite: 108.
Critical study of selected American masterpieces, with special attention to their literary values and to their significance as expressions of fundamental attitudes toward the individual and society.

374. British Masterpieces. (3-0) Cr. 3. Alt. S. Not Offered 1958 Prerequisite: 108.
Significant works of great English writers prior to 1776.

375. Romantic Literature. (3-0) Cr. 3. Alt. S. Offered 1958 Prerequisite: 108.
Reading and interpretation of representative works of Wordsworth, Coleridge, Byron, Shelley and Keats.

376. Victorian Literature. (3-0) Cr. 3. W. Prerequisite: 103.

384. Modern Fiction. (3-0) Cr. 3. S. Prerequisite: 103.

388. Modern Poetry. (3-0) Cr. 3. F. Prerequisite: 108.
Reading of representative works of significant American and British poets of the twentieth century; interpretation of the poems as the communication of personal and social values.

394. The Teaching of English. (3-0) Cr. 3. S. Prerequisite: Quality point average of 2.5 in 9 credits of English in courses above 108 selected by the student with the approval of the head of the department.

404. Business Correspondence. (2-0) Cr. 2. W.S. Prerequisite: Junior classification. Principles which govern the writing of business letters. Types of business letters.

414. Writing of Scientific Papers. (3-0) Cr. 3. F.W.S. Prerequisite: 103.
For juniors and seniors in co-operative technical departments. Principles of technical exposition; practice in composition of representative papers of various types.

464. Shakespeare. (3-0) Cr. 3. F.S. Prerequisite: 108.
Representative comedies, historical plays, and tragedies; emphasis upon understanding of human character.

466. Drama. (3-0) Cr. 3. W. Prerequisite: 108.
Study of plays representing the development of drama from classical to modern times as the presentation in dramatic form of human character in action.

487. Modern Drama. (3-0) Cr. 3. S. Prerequisite: 108.
Materials, techniques and philosophies of modern drama; reading, discussion, and criticism of representative modern plays.

484. The Literature of Family Life. (3-0) Cr. 3. F.W. S. Prerequisite: 108.
Junior classification or approval of head of department.
The relations of the individual to his family and to the community as reflected in selected works of fiction, drama, biography, and other types of literature.

499. Special Problems. Cr. 2 to 5 each time taken. Prerequisite: 15 credits in English or junior classification in addition to approval of head of the department. Designed to meet the needs of (1) students who seek work in areas other than those in which courses are offered; (2) students who desire to integrate a study of literature or language with special problems in major fields: A. Literature. B. History (history of the language; grammar and modern usage). C. Semantics. D. Criticism.
308. Radio Production. (2·1) Cr. 3. S. 
Prerequisite: Speech 302 or permission of instructor. 
Techniques of directing and producing radio programs: talks, interviews, forum discussions, special events and continuities. 

307. Speech Improvement. 
(3-0) Cr. 3. F.W.S. 
Basic principles underlying development of acceptable habits of speech; voice, enunciation, pronunciation, poise; practice in speaking adapted to needs of individual students. 

309. Oral Interpretation. 
(3-0) Cr. 3. F.S. 
Principles of oral interpretation; practice in analysis and reading aloud of literary selections. 

311. Speech-Making. (3-0) Or. 3. F.W.S. 
Prerequisite: Engl. 108. 
Fundamental principles of public speaking; audience analysis; interest and attention; selection and organization of speech material; delivery. Practice in preparation and delivery of extemporaneous speeches. 

(3-0) Cr. 3. F.W.S. 
Methods of application of fundamental principles of public speaking to composition and delivery of common types of business and professional speaking; practice in preparation and delivery of various types of speeches. 

320. Dramatics. 
Cr. 1 to 8 each time elected, with maximum of 6 credits. F.W.S. 
Prerequisite: Engl. 103 and permission of instructor. Rehearsal and production of plays. 

Cr. 1 to 8 each time elected, with maximum total of 6 credits. F.W.S. 
Prerequisite: Engl. 108 and permission of instructor. Basic radio techniques in announcing, acting, writing, selecting music and creating sound effects through rehearsals and actual production of radio programs.

324. Dramatic Production. (3-0) Cr. 3. S. 
Prerequisite: Engl. 103. Principles of play production; choosing the play, casting, rehearsing, acting, staging, lighting, and make-up. 

328. Television Production Techniques. 
(3-0) Cr. 3. F.W.S. 
Prerequisite: Permission of instructor. Theory and practice of television production. Various types of programs are studied with reference to the problems relating to directing; script preparation, casting, rehearsing, staging, lighting, sound, shooting and switching. 

332. Debate. 
Cr. 1 to 3 each time elected, with maximum total of 6 credits. F.W.S. 
Prerequisite: Engl. 103 and permission of instructor. Techniques of debate; platform and radio discussion. 

334. Persuasion. (3-0) Cr. 3. F.W.S. 
Prerequisite: 311. 
Principles and methods of persuasive speaking; discovery and use of evidence; proof: refutation; appeals; organization; delivery; practice in preparation and delivery of persuasive speeches upon topics of current interest. 

336. Group Discussion. (3-0) Cr. 3. S. 
Prerequisite: 311. 
Principles and types of discussion; practice in all types of group discussion, including parliamentary procedures; instruction in the handling of motions; conduct of parliamentary groups. 

(3-0) Cr. 3 each Yr. 
Prerequisite: Junior classification. 
(361) Analysis and interpretation of standard modern plays in terms of stage presentation. (362) Study of differing interpretations of representative current American and British plays as determined by differences in acting and staging. (363) Study of plays suitable for production by school and community groups.

FARM CROPS

For description of courses, see Department of Agronomy, courses in Farm Crops, page 120.

FOOD AND NUTRITION

ERCRL S. EPPRIGHT, Ph.D., Head of Department

PROFESSORS: Wilma D. Brewer, Ph.D.; Mary Agnes Frances Carlin, Ph.D.; Madge Miller, Ph.D.; Charlotte E. Roderuck, Ph.D.; Pearl P. Swanson, Ph.D.


ASSISTANT PROFESSORS: Pilar Garcia, Ph.D.; Jewel Graham, M.S.; Elizabeth Mackay, Ph.D.; Harriett Roberts, M.S.


Opportunities for Undergraduate Study

For undergraduate curricula in Food and Nutrition leading to the degree of Bachelor of Science, see page 84.
The department offers courses in Food and Nutrition which acquaint the student with food resources and principles underlying the selection, preparation and use of food for the health and enjoyment of the individual and of the family. Four majors are offered: Dietetics, Community Nutrition, Experimental Foods, Food and Nutrition and Related Science. See pages 84, 85 and 87.

Each of these majors affords excellent preparation for many different kinds of positions and provides a good basis for graduate study for students who wish to continue for advanced degrees.

The major in Dietetics fits the needs of students interested in food service and nutrition education. Graduates are prepared for a wide variety of positions in hospitals, clinics, sanitoria, homes for children and for the aged. They may work as private nutrition consultants in cooperation with physicians, or as nutritionists with food industries. This major includes the academic requirements of the American Dietetic Association.

The major in community Nutrition offers preparation for work as a nutrition specialist or consultant in public health, social welfare organizations, extension service or industry. This major is planned for students interested in helping people everywhere to use the knowledge in nutrition for the betterment of their health.

The major in Experimental Foods serves those who are interested in food and in food product development in experimental kitchens or laboratories. It prepares students for food promotion programs in industries, for food editorships in papers and magazines, and for conducting food programs on radio and television. It leads to careers in business and food research.

The major in Food and Nutrition and Related Science prepares for positions as research assistants in laboratories of colleges and universities, experiment stations, government agencies, industries and foundations. It affords an especially strong background for graduate work.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in foods and in 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 College. Students with undergraduate majors in biological and physical sciences are qualified for graduate study in food and nutrition.

Students taking major work either in foods or in nutrition for the degree of Doctor of Philosophy may choose minors to further their interests in related areas. Minors may be selected from other fields of home economics as well as from chemistry, bacteriology, food technology, psychology, microscopic anatomy, economics, statistics or technical journalism.

Open to graduate students for minor only: 305, 405, 409, 410.

Courses Primarily for Undergraduate Students

107. Introduction to Food and Nutrition. (3-0) Cr. 3. F.W.S.
The selection and use of food in relation to the health and well-being of the individual and to the needs of society.

204. Food Preparation. (2-6) Cr. 4 each. F.W.S. each.
Prerequisite: 107. Chem. 106.
Prerequisite: 204.
The basic application of scientific principles in the preparation of selected foods in the areas of beverages, vegetables, fruits, cereals and protein foods.

208. Foods II. (2-6) Cr. 5.
Prerequisite: 107, Chem. 264 or equivalent.
The basic application of scientific principles in the preparation of selected foods in the areas of crystallization, foams and emulsions, batters and doughs, and meats.

303. Family Meal Management. (1-6) Cr. 3. F.W.S.
Prerequisite: 205 or 208; H.Eq. 154.
Choice, purchase, preparation and service of foods with a consideration of nutritional needs of family groups, food habits, and social customs. Reservations

*To be dropped after Fall 1958.

**Effective Fall 1956.
must be made in advance with head of department.

305. Nutrition and Dietetics. (3-3) Cr. 4. F.W.
Prerequisite: Credit or classification in 303, Chem. 371, Zoöl. 155. Physical and chemical bases for nutrient needs; factors to consider in satisfying these needs for individuals and populations.

400. Field Study Tour. Required. W.S.
A. Prerequisite: Credit or classification in F&N 409. Observation of the nutritionist as part of a medical teaching center, hospital, clinic and community services.

405. Nutrition of the Child in the Family. (2-2) Cr. 4. S.
Prerequisite: 208, Chem. 371, C.D. 286 and permission of instructor. Nutritional needs during growth. Contribution of nutrition to total health of the child and of the family. Group feeding reports the laboratory investigation of a small problem in food research; guided group work in interpretation and evaluation of research literature pertinent to problem.

511. Experimental Foods I. (1-6) Cr. 3. F.
Prerequisite: 205 or 209, H. Eq. 154, Chem. 265 or 266. Experimental approach to the study of the chemical and physical properties of selected foods: eggs, emulsions, gels, batter and doughs.

512. Experimental Foods II. (1-6) Cr. 3. W.
Prerequisite: 511. Experimental approach to the study of the principles which underlie the reactions of fats, oils and meat. The organization and preparation of short, individual laboratory projects.

513. Experimental Foods III. (1-6) Cr. 3. S.
Prerequisite: 512. Each student designs, executes, and reports the laboratory investigation of a small problem in food research; guided group work in interpretation and evaluation of research literature pertinent to problem.

514. Community Nutrition. (2-3) Cr. 3. S.
Prerequisite: 305. Nutritional problems arising from food habits of population groups; methods of making dietary studies and judging apparent nutritional status. Field trips in conjunction with programs in nutrition of the State Department of Public Health and the Agricultural Extension Service.

550. Processed Food. (3-0 or 6) Cr. 3 or S.
Prerequisite: 411 or 511 and Chem. 371 or permission of instructor. The physical and chemical aspects of processed foods; methods of standardization, preservation and evaluation of the quality of processed foods.

Courses for Graduate Students

601. Principles of Normal Nutrition. (3-0) Cr. 3. S.
Prerequisite: 305, Chem. 375 or equivalent. A survey of normal nutrition. Required of all graduate students in the department.

606. Research Methods in Nutrition. (1-9) Cr. 4. F.
Prerequisite: 305, Chem. 265 or equivalent. Application of chemical techniques to research in nutrition.

Prerequisite: 506. The animal-feeding experiment as a technique in nutrition research.

608. Research Methods in Nutrition. (1-6) Cr. 3. S.
Prerequisite: 506. Application of the micro-biological assay to the quantitative estimation of vitamins and amino acids in foods, tissues and metabolic materials.

609. Diet Therapy. (3-0) Cr. 3. F.W.
Prerequisite: 505. Physiological basis for the use of special diets.

610. Nutrition During Human Growth and Development. (3-2) Cr. 3. F.W.
Prerequisite: 505. Nutritional needs during growth; indices of nutritional status and application of principles of nutrition to feeding infants and older children.

611. Selected Studies in Experimental Foods. (2-6) Cr. 4. F.W.
Prerequisite: 206 or 209, Chem. 264. Application of scientific principles to the solution of problems in food preparation. Not to be taken by majors in Experimental Foods or students desiring to take F&N 512.

615. Introduction to Nutrition Research. (0-0) Cr. 3. W.
Prerequisite: 305, Bact. 304A or B. Chem. 375. Introduction to methods used in nutrition research, with emphasis on application to selected problems.

616. Methods of Teaching Hospital Dietetics. (3-0) Cr. 3. S.
Prerequisite: 409. Observation of techniques, and organization of subject matter for teaching medical and dietetic interns, student nurses, and patients.

Courses for Advanced Undergraduate and Graduate Students

507. Special Topics. Credit as arranged. F.W.S.
Prerequisite: 305. A. Nutrition. B. Foods.

511. Experimental Foods I. (1-6) Cr. 3. F.
Prerequisite: 205 or 209, H. Eq. 154, Chem. 265 or 266. Experimental approach to the study of the chemical and physical properties of selected foods: eggs, emulsions, gels, batters and doughs.

512. Experimental Foods II. (1-6) Cr. 3. W.
Prerequisite: 511. Experimental approach to the study of the principles which underlie the reactions of fats, oils and meat. The organization and preparation of short, individual laboratory projects.

513. Experimental Foods III. (1-6) Cr. 3. S.
Prerequisite: 512. Each student designs, executes, and reports the laboratory investigation of a small problem in food research; guided group work in interpretation and evaluation of research literature pertinent to problem.
Techniques for subjective and objective measurements of food quality.

620. Advanced Foods. (3-0 or 2) Cr. 3 or 4.
A. Proteins.
B. Fats.
C. Carbohydrates.
Prerequisite: 518 or permission of instructor.

Physical and chemical behavior of basic food constituents. A series of non-sequience courses.


FOOD TECHNOLOGY

Administrative Committee: GEORGE M. BROWNING, Ph.D., Chairman

John C. Ayres, Ph.D.; Emerson W. Bird, Ph.D.; Mary Agnes Frances Carlin, Ph.D.; Paul A. Hartman, Ph.D.; Ralph M. Hixon, Ph.D.

Opportunities for Undergraduate Study

The field of food technology is concerned with technological application of the sciences and engineering arts to the manufacture, transportation, storage, distribution and utilization of food products. It is based on the fundamentals of biology, chemistry, microbiology and physics, any of which sciences find expression through an engineering operation. Many opportunities exist for persons trained in food technology; these are to be found in the following functional branches of this field:

1. Processing and manufacture of food products.
2. Quality control in the procurement, processing, manufacture, distribution and utilization of food products.
3. Economics of food processing, distribution, and consumption.
4. Legal specifications relative to composition, quality and safety of food products.
6. Research and development in food products and their by-products.

Because of the complexity of the field of food technology, undergraduate training is confined largely to the acquisition of the necessary background in the physical and biological sciences, although some work specifically applied to food technology is included. In addition, three months of practical work in the food industry is required. It is strongly recommended that at least one year of graduate work (leading to the Master's degree) be taken before embarking on a career in food technology.

For undergraduate curriculum in science, major in food technology, leading to the degree of Bachelor of Science, see page 97.

Opportunities for Graduate Study

Major work is offered for the degrees of Master of Science and Doctor of Philosophy in food technology.

Students majoring in food technology will choose a major professor from the graduate faculty membership of the departments cooperating in the graduate food technology program. Students will develop their programs of study under the guidance of committees nominated by the Administrative Committee, and appointed by the Dean of the Graduate College.

Prerequisite to major graduate work is the satisfactory completion of a suitable undergraduate curriculum, including courses in mathematics through differential and integral calculus; a year of physics based upon a year of college mathematics; chemistry (the equivalent of about eight quarters of chemistry, usually including inorganic, qualitative, quantitative and organic); one year in biology [botany and (or) zoology] and one course in general bacteriology.

Ordinarily the candidate's graduate committee will require, in addition to training in statistics and chemical engineering, the following courses for the doctorate: Bact. 501, 535, 536 and Chem. 323, 531, 574, or substitutions approved by the Administrative Committee.
FOREIGN TRADE AND SERVICE PROGRAMS

Administrative Committee: ALFRED P. KEILENBRECK, Ph.D., Chairman
Wendell H. Bragonier, Ph.D.; Harvey C. Diehl, Ph.D.; Roy M. Kottman, Ph.D.; William H. Thompson, Ph.D.

The major in Foreign Trade and Service Programs is designed for students interested in (1) the foreign trade section of a business; (2) a government agency; (3) the use abroad of technical training in connection with agriculture, business or government. Programs of study are arranged according to the emphasis desired. A phase of preparation basic for a large majority of those contemplating foreign service is mastery of the language of the foreign area involved. Students not planning to offer special preparation in one of the sciences, in agriculture, or in engineering will emphasize economics, history, psychology, sociology—in general, the culture and history of the foreign area. It should be noted that business concerns advise that wives of students preparing for foreign service should plan to prepare themselves in language and history.

For further details, undergraduate students should confer with the chairman of the Committee on Foreign Trade and Service Programs. For training for foreign trade and service in agriculture, see page 50.

FORESTRY

GEORGE B. HARTMAN, M.S., Head of Department

PROFESSORS: Dwight W. Bensend, Ph.D.; Leonard F. Kellogg, M.F.; Gilmour B. MacDonald, D.Agr.; Andrew L. McComb, Ph.D.
ASSOCIATE PROFESSORS: Julius A. Larsen, Ph.D.; Harold S. McNabb, Jr., Ph.D.; George W. Thomson, Ph.D.
ASSISTANT PROFESSOR: Gordon E. Gatherum, M.S.
INSTRUCTORS: James Donald Burton, M.F.; Martin E. Craine, B.S.; Norman J. Hansen, M.S.

Opportunities for Undergraduate Study

For undergraduate curricula in forestry leading to the degree of Bachelor of Science, see page 50.

The department offers a four-year curriculum with options in forest management and wood utilization and a five-year curriculum with five options as listed on pages to .

A ten-week summer camp between the freshman and sophomore years is required of all students.

A six-week camp for advanced work following the junior year is optional.

See page 18 for fees.

The four-year curriculum with two options is designed to prepare students for administrative or research work with the United States Forest Service and other federal agencies; for similar positions with various state forestry departments; for the lumber, paper, plywood, and other forest industries; for wholesale and retail lumber marketing; for grazing and wildlife management work; for teaching and extension work; and for farm forestry work.

The five-year curriculum offers opportunity for additional specialization for major work in the following fields: conservation, forest utilization and marketing, range management, wildlife management, and farm forestry.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in silviculture, forest management, wood technology, forest utilization and forest range management; and minor work to students taking major work in other departments. Work may be taken for the degree of Doctor of Philosophy in either silviculture or wood technology, as divided major with departments offering work in related fields for this degree.
FORESTRY

Students desiring to major in this department should present forestry credits substantially equivalent to those required of undergraduate students in this institution. Minor work is usually recommended in fields closely related to the area of major interest.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only: 301, 302, 388, 400, 426, 443, 470, 484, 486, 488, 491, 492, 497.

Courses Primarily for Undergraduate Students

101. General Forestry. (0-9) Cr. 3. F. Introduction to field forestry and training in field drawing.

102. General Forestry. (3-0) Cr. 3. W. General survey of the field of forestry.

103. Elementary Forest Measurements. (0-8) Or. 1. S. Elements of land measurements, use of instruments and basic field procedures as applied to forestry.

110. Seminar. (1-0) Required. F. Discussion of current topics relating to forestry.

113. Seminar. (1-0) Required. S. Orientation and discussion of current topics related to forestry. Not open to forestry students.


214. Silviculture. (0-9) Or. 3. Summer Camp Field studies of forest types and stands; forest ecology; improvement of young stands; forest regeneration.

220. Farm Forestry. (2-2) Cr. 3. and Alt. S. Offered 1958. Place of forestry on the farm. Establishment, protection and management of plantations, windbreaks and woodlot products. Field demonstrations. Not open to forestry students.

224. Logging and Milling. (4-0) Cr. 4. F. Logging and milling practices in the principal forest regions; methods employed and equipment used.

224. Wood Utilization. (0-9) Or. 3. Summer Camp Forest industries: logging and milling operations; pulp and paper plants and other wood utilization activities.


242. Forest Measurements. (2-8) Or. 3. S. Prerequisite: 241. Elementary studies in growth of trees and stands.

243. Forest Mapping. (0-6) Or. 2. Summer Camp Instrumentation; forest mapping, establishment of vertical and horizontal controls and contour mapping as applied to forestry.

244. Forest Measurements. (0-12) Cr. 4. Summer Camp Field practices in scaling logs and estimating timber stands. Collecting data and preparing forest maps.

250. Forest Operations. (0-9) Or. 3. Summer Camp Study of various field activities on national forests.

301. Foundations of Silviculture. (3-0) Or. 3. W. Prerequisite: Bot. 205. Agron. 154. The life history and general characteristics of trees, stands and types with particular reference to the effects of environmental factors. Forest influences.

302. Practices of Silviculture. (3-0) Or. 3. S. Prerequisite: 301. Scientific systems of producing, tending and harvesting forests with application to forests of various ages and composition.

303. Regional Silviculture. (3-0) Or. 3. F. Prerequisite: 292. Silvicultural practices for important forest species, types and regions in the United States and abroad.

304 Silviculture Laboratory. (0-9) Or. 3. S. Prerequisite: Credit or classification in 302. Laboratory and field work covering classification of forests and trees and their relation to site, production and handling of nursery stock, reforestation techniques, intermediate cuttings and reproduction methods. Weekend field trips.

321. Farm Forestry. (2-3) Or. 3. Alt. S. Offered 1958. Prerequisite: 244, 301. Application of specific forestry techniques to the problems of the woodlot with special emphasis on woodlot grazing, woodlot management, measurement and marketing of woodlot products, extension forestry and the promotion of forestry for farmers.


388. Wood Technology. (1-9) Or. 4. W. Prerequisite: Bot. 101. Structural and physical properties of commercial woods; identification and chief uses.

390. Forest Protection. (3-0) Or. 3. S. Prerequisite: Phys. 211. Character and extent of damage to forests by fire, weather, animals and disease. Forest fire prevention, pre-suppression and suppression, fire control equipment, fire damage appraisals and forest fire insurance.


402. Forest Policy and Administration. (3-0) Or. 3. S. State and national forest laws and policies. Tunnel organization, financing and supervision of federal, state and local public and private forest enterprises; forest improvements; grazing, timber sales and special uses.

411. 412, 413. Seminar. (1-0) Required. Yr. Current reports on forestry and allied topics.

425. Seasoning of Wood. (3-0) Or. 3. F. Prerequisite: 366. Wood moisture relations; seasoning defects; air seasoning and kiln drying of wood.
426. Machining and Bonding of Wood. (2-3) Cr. 3. S. 
**Prerequisite:** 425. 

438. Lumber Markets. (3-0) Cr. 3. W. 
Economics of the timber industry. Wholesale and retail. Exports and imports of lumber and other forest products; lumbermen's associations; prices; freight rates.

440. Biological Problems. Cr. 2 to 6. F.W.S. 
**Prerequisite:** Junior classification and quality point average of 2.5 or more for preceding two quarters. Original investigations in advanced technical work.

443. Forest Mensuration. (2-3) Cr. 3. W. 
**Prerequisite:** 241, 242. 
Analysis of data concerned with management, silviculture and utilization. Current sampling patterns for timber estimation. Study of modern measurement techniques concerned with all phases of forestry.

445. Forest Photogrammetry. (3-0) Cr. 4 or (3-0) Cr. 1. F. 
**Prerequisite:** 242, 302 or permission of instructor. 
Use of aerial photographs in forest management. Measurement of land, trees and timber. Use of remote sensing. Preparation of type, planimetric, and topographic maps from aerial photographs.

470. General Forest Economics. (Ec. 470) (3-0) Cr. 3. W. 
**Prerequisite:** Ec. 241 or equivalent. 
Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests.

484. Properties of Wood. (3-9) Cr. 3. Alt. Summers Offered 1958 
**Prerequisite:** 1. Ed. 205 or permission of instructor. 
Structure and identification of wood; storage and handling of lumber; seasoning and other defects in lumber; machining and preparation of wood for gluing, woodworking glues. Not open to forestry majors.

486. Forest Products. (3-0) Cr. 3. F. 
**Prerequisite:** 386. 
Primary forest products including construction materials, pulpwood, naval stores, containers and wood as fuel.

487. Forest Products. (3-0) Cr. 3. W. 
**Prerequisite:** 486. 
Processing of forest products, including chemically derived, mechanically reduced and other products of the forest. Field trip to the Forest Products Laboratory, Madison, Wisconsin.

493. Range Management I. (2-3) Cr. 3. F. 
**Prerequisite:** Bot. 206. 

492. Forest Range Management II. (3-0) Cr. 2. W. 
**Prerequisite:** 491. 
Range conservation, improvements, administration and economics. Range wildland problems. Forest and woodland grazing.

493. Forest Range Management III. (3-3) Cr. 3. S. 
**Prerequisite:** 492. 
Range surveying and management planning on publicly-owned range lands.

494. Forest Range Management. Cr. 3 to 9. Summer Camp 
**Prerequisite:** Bot. 206. 
Detailed field studies of administration and management of range areas on national and state forests.

495. Forest Management. 
Cr. 3 to 9. Summer Camp 
**Prerequisite:** 492, 494. 
Management and administration of specific national, state or private forest lands.

496. Forest Management. (3-0) Cr. 3. W. 
**Prerequisite:** 302, 490. 
Organization of the forest for management. Study of the factors used in forest regulation.

498. Forest Management. (3-0) Cr. 3. S. 
**Prerequisite:** 497. 
Regulation of the forest for sustained yield. Forest management plans. Present practice of forestry.

Courses for Advanced Undergraduate and Graduate Students

502. Advanced Silviculture. (8-0) Cr. 3. W. 
**Prerequisite:** 390. 
Mr. McComb 
The tree and the site as factors in forest production; differentiation, multiplication and use of superior individuals, varieties and races in forestry; site factors and site evaluation in relation to choice of species and maintenance of productivity.

507. Forest Influences. (8-0) Cr. 3. F. 
**Prerequisite:** 302, Agron. 154. Mr. McComb 
Relation of forests to climate, soil water, and other products of the forest. Field trip to the Forest Products Laboratory, Madison, Wisconsin.

508. Mechanical and Physical Properties of Wood. (3-0) Cr. 3. S. 
**Prerequisite:** 385. 
Mechanical properties of wood and the structural and physical characteristics affecting these properties.

509. Forest Utilization. 
Cr. 3 to 9. Summer Camp 
**Prerequisite:** 224, 426. 
Detailed study of operation and management of private forest industries.

510. Forest Finance. 
(En. 490) (3-3) Cr. 4. F. 
**Prerequisite:** 242, En. 241. 
Appraisal of forest land and stumpage. Determination of profits in forest enterprises. Appraisal of damages to forest property.

511. Forest Range Management I. 
(2-3) Cr. 3. F. 
**Prerequisite:** Bot. 206. 

Courses for Graduate Students

500. Research. F.W.S. 
A. Silviculture. Mr. McComb 
B. Wood Technology. Mr. Bensend 
C. Forest Economics. Mr. Hartman 
D. Forest and Range Management. Mr. Kellogg

504. Advanced Silviculture. 
Cr. 2 to 5. F.W.S. 
**Prerequisite:** 302. Mr. McComb 
Research in wood in silviculture. Studies in silvicultural practice in given regions.
involving special marketing, land use, climatic, edaphic, or biotic conditions.

670. Advanced Forest Economics. (Ec. 670)  
Or. 2 to 5. F.W.S.  
Prerequisite: 470 and Ec. 308 or equivalent. Mr. Hartman.  
Advanced studies in the economics of forestry involving the economics of the firm and industry, marketing and institutional economics as they relate to:  
A. Forest Management.  
B. Forest Utilization (Products).

688. Advanced Wood Technology.  
Or. 2 to 5. S.  
Prerequisite: 388. Mr. Bensend  
Relation of structure to the mechanical and physical properties of wood.

689. Forest Industries.  
Cr. 2 to 5. W.S.  
Industries depending upon forest products, including paper and pulp, veneer, naval stores, wood distillation, timber preservation, and other minor industries.

694. Advanced Forest Management.  
Cr. 2 to 5. F.  
Prerequisite: 498. Mr. Kellogg  
Special problems in regulation of forest yield. Forest working plans.

GENETICS

JOHN W. GOWEN, Ph.D., Head of Department

PROFESSOR: Joseph G. O'Mara, Ph.D.

ASSOCIATE PROFESSOR: Willard F. Hollander, Ph.D.

ASSISTANT PROFESSORS: John H. D. Bryan, Ph.D.; Peter A. Peterson, Ph.D.; Janice Stadler, Ph.D.

INSTRUCTOR: James D. Smith, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in genetics, leading to the degree of Bachelor of Science, see page 97.

The Department of Genetics offers instruction in the science of heredity, and in the operation of the laws of inheritance in domestic animals, in economic plants and in human populations. The courses are also intended to demonstrate the broad cultural and philosophical aspects of this biological science.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in genetics, and minor work to students taking major work in other departments.

Prerequisite to major work is the completion of a thorough undergraduate curriculum in agriculture, or in a biological science, with evidence of good scholarship and aptitude for scientific research.

Students taking major work in genetics will ordinarily take minor work in agronomy, animal husbandry, bacteriology, biochemistry, botany, horticulture, mathematics, veterinary medicine or zoology.

Courses Primarily for Undergraduate Students

*200. Basic Genetics. (3-0) Or. 3. W.  
For two-year farm operation students only.  
Basic principles of genetics and their relation to plant and animal breeding.

*300. General Genetics. (3-0) Or. 3. F.W.S.  
Prerequisite: Course in botany or zoology.  
Not open to freshmen.  
Fundamental principles of genetics and their operation in plant, animal and human populations.

305. Elementary Laboratory.  
(0-6) Or. 2. F.W.  
Prerequisite: Should accompany or follow 200.  
Laboratory experiments illustrating the laws of heredity.

400. Human Heredity. (3-0) Or. 3. S.  
Prerequisite: Junior classification.  
Principles of heredity as applied to man. Not open to students who have credit in 200 or 300.

Courses for Advanced Undergraduate and Graduate Students

500. Genetics, Evolution, and Biology.  
(3-0) Or. 3. F.  
Prerequisite: 300. Mr. O'Mara  
Integration of modern theories and knowledge of evolution and genetics.

536. Genetic Statistics.  
(Stat. 536) See Statistics.

540. Special Topics.  
(0-3 to 9) Or. 1 to 3. F.W.S.  
Prerequisite: Elementary genetics. Messrs. Gowen, O'Mara

567, 568, 569. Introduction to Biophysics.  
(Bact. 567, 568, 569, Phys. 567, 568, 569) See Physics.
Courses for Graduate Students

605. Cytogenetics. (Bot. 605) See Botany.

630. Advanced Genetics. (8-2) Cr. 4. S.
Prequisite: Elementary genetics. Mr. O'Mara
Fundamental theories in genetics, including mutation, linkage, selection, biometry, sex determination and heterosis.

635. Animal Genetics. (8-2) Or. 4. F.
Prequisite: Elementary genetics equivalent to 600 and 305. Mr. Gowen
Principles of inheritance and their application to farm animals, including methods of breeding for economic characters, known genes, use of hybridity, linkage, chromosome aberrations, disease resistance and X-ray analysis of gene structure.

650. Seminar. Cr. 1. Messrs. Gowen, O'Mara


660. Research. Messrs. Gowen, O'Mara

GEOLOGY

CHALMER J. ROY, Ph.D., Head of Department

PROFESSORS: Charles S. Gwynne, Ph.D.; Keith M. Hussey, Ph.D.
ASSOCIATE PROFESSOR: Leo A. Thomas, Ph.D.
ASSISTANT PROFESSORS: Donald L. Biggs, Ph.D.; John Lemish, Ph.D.

Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in geology, leading to the degree of Bachelor of Science, see page 97.

The department offers fundamental courses in geology designed to give the student a knowledge of the composition of the earth, the processes which are at work upon it, and its history. For those who plan to engage in professional work in the field of geology a sequence of more advanced courses in the various subdivisions of the science is provided, continuing through the junior and senior years. In the senior year such students may take courses particularly applicable to specialized fields of geology. At least one year of graduate work is essential for those planning to engage in professional geological work.

Undergraduate majors in this department usually have included the following basic courses in their programs: 100, 202, 203, 253, 300, 354, 355, 356, 435 and 15 additional credits in courses numbered above 300. As supporting work the following courses are desirable: Zool. 105; Chem. 103; Engl. 205, 414; Math. 213; Phys. 213, 309. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for graduation. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Minor work should be taken in two of the following: chemistry, chemical engineering, mathematics, statistics, physics, zoology, civil engineering.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in geology, and minor work to students taking major work in other departments. Work may be taken for the degree of Doctor of Philosophy as a divided major with departments offering work in related fields for this degree.

Students desiring to major in geology should have completed the equivalent of the following courses: 202, 203, 300, 354, 355, 356; and 434, 435, or 454, 455.

Minor work is usually recommended in chemistry, mathematics, physics, soils, soils engineering, or zoology.

Open to graduate students for minor only: 355, 401, 402, 434, 435, 436, 454, 455.

Courses Primarily for Undergraduate Students

100. Introduction to Geology.
(0-6) Cr. 3. F.W.S.
The astronomical relationships of the earth; the nature and effects of internal and external earth processes and an introduction to the history of the earth and of life upon it. Occasional field trips will be included.

202. Physical Geology.
(8-0 or 8) Cr. 3 or 4. F.W.S.
Prequisite: 100, except for students who are required to take 202 only.
The nature and origin of land forms, their geological relationships and interpretation. Field trips.
203. Historical Geology. 
(3-0 or 8) Cr. 3 or 4. F.W.S. 
Prerequisite: 100 or 202. 
Methods of investigating the history of the earth and its inhabitants; significant events in the development of the earth and of the plant and animal kingdoms. Field trips.

253. Elementary Petrology. (1-6) Cr. 3. S 
Prerequisite: 100. 
The classification, identification and description of the common rocks and rock-forming minerals. Field trips.

300. Summer Field Work. Cr. 6 to 12. SS. 
Eight weeks summer camp following sophomore year, required of all geology majors. Areal mapping, structural and stratigraphic analyses, written report with appropriate illustration required.

304.** World Geography. (3-0) Cr. 3. W. 
Prerequisite: 100. 
Worldwide consideration of the elements of geography, physical and cultural, and the interrelation between them and man. 

305.** Economic Geography. (3-0) Cr. 3. S. 
Prerequisite: 304. 
Occurrence and distribution of natural resources; their relations to commercial and industrial enterprises.


311. Geologic Interpretation of Aerial Photographs. (1-6) Cr. 3. S. 
Prerequisite: 300. 
Principles of aerial photography and the use of aerial photographs in the analysis and interpretation of landscapes and geologic structures.

354. Structural Geology. (3-0) Cr. 3. F. 
Prerequisite: 208. 
Structure of earth's crust and interpretations of rock structures.

355. Mineralogy. (2-6) Cr. 4. W. 
Prerequisite: Chem. 102. 
Geochemistry of silicates and other rock-forming minerals; determinative mineralogy.

**Not acceptable as credit toward a major in geology.

Courses for Advanced Undergraduate and Graduate Students

554. Advanced Structural Geology. 
(6-0) Cr. 2. W. 
Prerequisite: 354. Mr. Lemish 
Graphic and mathematical solution of structural problems.

557. 558. Advanced Petrology and Petrography. (2-6) Cr. 4 each. W.S. 
Prerequisite: 356, 454. Mr. Roy (557) Igneous and metamorphic rocks. (558) Sedimentary rocks. Field trips.

566. Seminar. F.W.S. 
Cr. 1 each time elected. Required of all graduate students and open to advanced undergraduates with approval of the head of the department. Messrs. Hussey, Roy, Thomas

567. 568. Invertebrate Paleontology. 
(3-8) Cr. 4 each. W.S. 
Prerequisite: 455. Mr. Thomas. 

569. Micropaleontology. (3-8) Cr. 4. F. 
Prerequisite: 455. Mr. Thomas. 
Fossil protozoa and other small organisms in relation to stratigraphic geology. Field trips.

571, 572, 573. Advanced General Geology. 
(3-0) Cr. 3 each. Yr. 

Courses for Graduate Students

664. Special Topics. 
Cr. 1 to 3 each time taken. 
A. Glacial Geology. Mr. Hussey 
B. Stratigraphy. Mr. Thomas 
C. Paleontology. Mr. Thomas 
D. Petrology and Petrography. Mr. Roy 
E. Dynamic and Structural Geology. Messrs. Hussey, Roy 
F. Micropaleontology. Mr. Thomas

565. Research. 
A. Glacial Geology. Mr. Hussey 
B. Stratigraphy. Mr. Thomas 
C. Paleontology. Mr. Thomas 
D. Petrology and Petrography. Mr. Roy 
E. Dynamic and Structural Geology. Messrs. Hussey, Roy
HISTORY, GOVERNMENT AND PHILOSOPHY

CLARENCE H. MATERSON, Ph.D., Head of Department


ASSISTANT PROFESSORS: Donald E. Boles, Ph.D.; Edwin W. Peterson, A.M.; John T. Schlebecker, Ph.D.

INSTRUCTOR: Fred M. Mansbridge, A.M.

Opportunities for Undergraduate Study

The department provides general introductory courses of instruction in history, government and philosophy designed for all students to serve either as a part of their general education or as a background for further work in any of the three fields. The department also offers courses for students who need a knowledge of history, government or philosophy as a corollary to or preparation for their vocational training.

The department offers a major in either history or government and courses are offered to provide advanced undergraduate work in the areas of American History, European History, the History of Science, International Relations, Government and Philosophy.

Undergraduates majoring in other departments may take minors in either history, government or philosophy.

Undergraduate majors in this department have usually included the following basic courses in their programs: 211, 212, 213, or 311, 312, 313, or 321, 322, 323. As supporting work, undergraduate majors have found the following courses desirable: Ec. 241, 242, 243; Soc. 134; Engl. 254. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or counselors who wish to estimate the amount of basic, non-specialized study which may be needed.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in economic history; and minor work in economic history and in government to students taking major work in other departments.

Prerequisite to major graduate work in the department is the completion of at least thirty quarter credit hours in history and fifteen credits in political science and economics.

Open to graduate students for minor only:

Hist. 401, 402, 403, 425, 440, 441, 442, 450, 460, 465 495; Govt. 424, 437, 446, 460, 462, 468, 470, 476, 477, 478, 480, 485, 487, 490, 491, 495; Phil. 441, 442, 443, 495.

Courses in History

Courses Primarily for Undergraduate Students

211, 212, 218. European and American Civilization Since 1350. (3-0) Or. 3 each. Yr.
   (211) Survey of breakup of medieval society, the Renaissance and conditions which produced the expansion of Europe; the impact of Europe upon colonial America; the American Revolution and its results.
   (212) The influence of revolutions; political and industrial, upon both Europe and America; background of the civilization of the present.
   (218) Prerequisite: 212. Present century similarities and differences; interrelationships between Europe and America. Origins and results of wars and depression.

811, 812, 813. Introduction to Western Civilization. (3-0) Or. 3 each. Yr.
   811. Prerequisites: 811.
   813. Prerequisites: 812.
   Social and cultural development of Western civilization from the Ancient Orient to the present, emphasizing economic and political institutions; changes in habits, customs, and ideas; the background of recent developments.

321, 322, 323. History of the American Nation. (3-0) Or. 3 each. Yr.
   321 National Foundations. Colonial background; revolution; confederation and constitutions; nationalism and democracy.
   322 National expansion and internal
conflict. Forces of unity and disunity; division and reunion.

324. History of American Agriculture. (3-0) Cr. 3. F.W.S.
Colonial foundations; westward movement; public land policies; regional specialization; transportation and markets; agricultural and industrial change; farmers' movement; politics and legislation; relation of state to agriculture.

331, 332, 333. World Politics and International Organization. (3-0) Cr. 3. F.W.S.
Survey of the basic factors underlying international politics; the nation-state system; elements, distribution, and role of national power; objectives of foreign policy; causes of war and conditions of peace.

332. Application of principles underlying international politics to the power position and foreign policy of the individual states and their international conflicts and their solution.

333. Organization and methods devised by states for dealing with their common problems of defense and security; welfare activities at the international level; special attention to the problems arising in the United Nations.

334, 335. Economic History of the United States. (3-0) Cr. 3 each.
Since 1865. W.S.
Growth of important industries; regional specialization; development of economic institutions; relation of government to business enterprise.

401, 402, 403. Economic History of Modern Europe. (3-0) Cr. 3 each yr.
Prerequisites: 6 credits in history. (401) Application of political revolutions, 1750-1832. English and continental heritage from medieval Europe; mercantilism and laissez-faire; commercial, industrial, agricultural and political revolutions; economic institutions and reforms. (402) British and continental competition, 1832-1914. Commercial theory and practice; rise of continental industry; changes in agriculture, labor, transportation, and markets; protectionism; imperialism. (403) New Europe since 1914. Economic aspects of World War I; revolutions, revolutions.

Any subject listed in the following history sequence may be taken independently: 331, 332, 333; 334, 335; 401, 402, 403.

Courses for Advanced Undergraduate and Graduate Students

522. Social and Intellectual History of the United States. (3-0) Cr. 3. S.
Prerequisites: 9 credits in history and government. Mr. Greene
Development of social and intellectual movements, institutions, and leaders.

526. Development of the United States Constitution to 1885. (3-0) Cr. 3. S.
Prerequisites: 9 credits in history or government. Mr. Bole.
Development of the United States Constitution from England; colonial contributions to constitutional development; making the Constitution; problems of the new government; development of governmental activities through Supreme Court decisions; effect of the Civil War on the Constitution.

527. Development of the United States Constitution Since 1885. (3-0) Cr. 3. W.
Prerequisites: 9 credits in history or government. Mr. Bole.
Constitutional aspects of reconstruction; governmental regulations of banking, agriculture and business; expansion of governmental functions; emphasis upon constitutional significance of the World War; U. S. Progressive movement and the New Deal.

584. The Westward Movement. (3-0) Cr. 3. S.
Prerequisites: 9 credits in history. Mr. Schlebecker
The west under Spain, France and England; territorial acquisitions; westward migration to the Mississippi; economic, political and social development of the Great Plains and the prairie states.

585. The Trans-Mississippi West. (3-0) Cr. 3. W.
Prerequisites: 9 credits in history. Mr. Schlebecker
European colonization and settlement of the Great Plains and Rocky Mountain areas; the
Viewing the document as if it were a natural text, we can extract the following information:

**Courses for Graduate Students**

604. Research in Economic History.

**Courses in Government**

**Courses Primarily for Undergraduate Students**


- **Course Title:** American Government
- **Credit Hours:** 3
- **Course Code:** 3-0
- **Prerequisite:** F.W.S.
- **Course Description:** Fundamentals of democracy; nature of federalism; organization, functions, and working relation of national government to agriculture, business, industry and commerce; role of citizens and parties.


- **Course Title:** State and Local Government in the United States
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Organization and functions; state regulations and operation; special problems including reorganization of state and local government; consolidation of governmental areas; financial control; state civil service.

437. Municipal Government and Administration.

- **Course Title:** Municipal Government and Administration
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** The rise of city in American life; legal position of municipal corporation; forms of organization; personnel and fiscal administration; planning; streets and lights; police and fire administration; public health; recreation; water supply; sanitation; schools; libraries; public welfare; administration; utility regulation.

446. European Governments.

- **Course Title:** European Governments
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Comparative examination of governments of England, France, Germany, Russia, Italy, and Switzerland; political problems of those countries; comparison with United States.

460. Constitutional Law.

- **Course Title:** Constitutional Law
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Development of the United States Constitution through judicial action; influences of public law and judicial interpretations upon American government and society.

462. International Law.

- **Course Title:** International Law
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Development of the principles of international law of peace and war; analysis of theories concerning its nature and fundamental conceptions, its relation of national law; problems of international legislation and codification.

468. Political Parties.

- **Course Title:** Political Parties
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Origin and development; relation to democratic process; membership and organization; nominations and elections; persistence of spoils system; campaign strategy; party finance and bosses; party realignment.

470. Public Opinion and Pressure Polities.

- **Course Title:** Public Opinion and Pressure Polities
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Nature of public opinion in a democracy; relationship of public opinion and public interest; various agencies and pressure groups influencing public opinion; their effect upon governmental policies and governmental personnel; importance of political education.

476. Public Administration.

- **Course Title:** Public Administration
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Principles applied to national, state, and local governments; problems of organization, personnel, purchasing and supply, financial procedure; problems and tendencies in the national and Iowa governments.

477. Governmental Budgeting.

- **Course Title:** Governmental Budgeting
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Planning, control and administration in governmental financial systems in the United States—national, state, and local; historical development of these systems; organization and structural features of the financial control agency; relations to other governmental agencies; administration, accounting, treasury operation, financial planning and investigation; assessment, procurement, auditing.

478. Public Personnel Administration.

- **Course Title:** Public Personnel Administration
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Civil service systems in the United States—national, state, and local; history of civil service; development of the merit principle; administration of recruitment, selection, classification, promotion, service ratings, discipline, retirement and employee organization.


- **Course Title:** Government and Industry
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Theories of constitutional protection.

**COLEGE INSTRUCTION**

546. Foreign Relations of the United States, 1776-1898.

- **Course Title:** Foreign Relations of the United States, 1776-1898
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Development of fur trade, cattle and mining kingdoms; social and institutional modifications; passing of the frontier; effect of the Far West on national development.

554. Foreign Relations of the United States, 1776-1918.

- **Course Title:** Foreign Relations of the United States, 1776-1918
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** European background; French alliance and independence; struggle for neutrality; Monroe Doctrine; diplomacy of westward expansion; War between States; economics of diplomacy.

555. United States as a World Power Since 1898.

- **Course Title:** United States as a World Power Since 1898
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** The "New Manifest Destiny" of the United States; American interests and policies in Europe, Latin America, and the Far East; isolation to intervention in the World Wars of 1914 and 1939; the United States in the postwar world.

568. International Relations.

- **Course Title:** International Relations
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Intensive study of American-Russian diplomatic relations, including comparison and contrast in historical backgrounds; history of diplomatic relations; analysis of present policies and power relationships; study of specific problems and areas in relations between the United States and the Soviet Union at the present time.

590. Special Topics in History.

- **Course Title:** Special Topics in History
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Comparison of those countries; comparison with England, Italy, Switzerland; understanding of American government; interpretation upon American government; comparison with American interests in the Far East; isolation to intervention in the United States, national, state, and local; history of civil service; development of the merit principle; administration of recruitment, selection, classification, promotion, service ratings, discipline, retirement and employee organization.

Course for Graduate Students

604. Research in Economic History.

- **Course Title:** Research in Economic History
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Messrs. Cole, Greene, Matterson, Moody

Courses in Government

**Courses Primarily for Undergraduate Students**


- **Course Title:** American Government
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** F.W.S.
- **Course Description:** Fundamentals of democracy; nature of federalism; organization, functions, and working relation of national government to agriculture, business, industry and commerce; role of citizens and parties.


- **Course Title:** State and Local Government in the United States
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Organization and functions; state regulations and operation; special problems including reorganization of state and local government; consolidation of governmental areas; financial control; state civil service.

437. Municipal Government and Administration.

- **Course Title:** Municipal Government and Administration
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Rise of city in American life; legal position of municipal corporation; forms of organization; personnel and fiscal administration; planning; streets and lights; police and fire administration; public health; recreation; water supply; sanitation; schools; libraries; public welfare; administration; utility regulation.

446. European Governments.

- **Course Title:** European Governments
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Comparative examination of governments of England, France, Germany, Russia, Italy, and Switzerland; political problems of those countries; comparison with United States.

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- **Course Title:** Constitutional Law
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Development of the United States Constitution through judicial action; influences of public law and judicial interpretations upon American government and society.

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- **Course Title:** International Law
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Development of the principles of international law of peace and war; analysis of theories concerning its nature and fundamental conceptions, its relation of national law; problems of international legislation and codification.

468. Political Parties.

- **Course Title:** Political Parties
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Origin and development; relation to democratic process; membership and organization; nominations and elections; persistence of spoils system; campaign strategy; party finance; machine and bosses; party realignment.

470. Public Opinion and Pressure Polities.

- **Course Title:** Public Opinion and Pressure Polities
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Nature of public opinion in a democracy; relationship of public opinion and public interest; various agencies and pressure groups influencing public opinion; their effect upon governmental policies and governmental personnel; importance of political education.

476. Public Administration.

- **Course Title:** Public Administration
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Principles applied to national, state, and local governments; problems of organization, personnel, purchasing and supply, financial procedure; problems and tendencies in the national and Iowa governments.

477. Governmental Budgeting.

- **Course Title:** Governmental Budgeting
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Planning, control and administration in governmental financial systems in the United States—national, state, and local; historical development of these systems; organization and structural features of the financial control agency; relations to other governmental agencies; administration, accounting, treasury operation, financial planning and investigation; assessment, procurement, auditing.

478. Public Personnel Administration.

- **Course Title:** Public Personnel Administration
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Civil service systems in the United States—national, state, and local; history of civil service; development of the merit principle; administration of recruitment, selection, classification, promotion, service ratings, discipline, retirement and employee organization.


- **Course Title:** Government and Industry
- **Credit Hours:** 3
- **Course Code:** 0-3
- **Prerequisite:** 115
- **Course Description:** Theories of constitutional protection.
governmental assistance to business and agriculture; government and labor; corrective legislation in corporate organization; unfair practices; securities issues; business taxation; bankruptcy; business with a public interest.

445. Political Science in Theory and Practice. (3-0) Cr. 3. W. Prerequisite: 315. Analysis of basic concepts; popular sovereignty, liberty, power, justice. Governmental techniques as applied to the democratic process; constitutions, political parties and public opinion, representative systems, legislatures, bureaucracy, governmental career service.

447. American Political Thought. (3-0) Cr. 3. S. Prerequisite: 315. Analysis of main trends in the development of American political ideas, political institutions, and governmental policies, an attempt to explain the geographic, economic, social and cultural forces motivating the development of American political thought; to indicate the relation of the political theories to reality, and to show how theories determine subsequent political action.

Courses in Philosophy

260. Introduction to Philosophy. (4-0) Cr. 4. F.W.S. Introduction to the living issues of philosophy in the ethical, social, scientific, and speculative fields.

321. Introduction to the Old Testament. (3-0) Cr. 3. F. Major books in the Old Testament within the framework of their historical background; with particular attention to 260. the development of the great religious and ethical ideas.


329. Religion and Mankind. (4-0) Cr. 4. S. Designed to stimulate sympathetic exploration of religion through acquaintance with historical development and character of major religions, including Zoroastrianism, Hinduism, Buddhism, Confucianism, Taoism, Shinto, Judaism, Mohammedanism, and Christianity.

370. Introductory Logic. (3-0) Cr. 3. F.W.S. Introduction to the principles of deductive and inductive reasoning; practice in the analysis of types of reasoning.

421. Early and Medieval Christianity. (3-0) Cr. 3. Alt. F. Offered 1958 Prerequisite: 322. The spread of Christianity and the development of Christian thought and institutions from the end of the Apostolic Age to the Middle Ages. The relations between church and society from the time of Trajan to the Council of Constance. Readings in the church fathers and medieval literature.

422. Modern Christianity. (3-0) Cr. 3. Alt. W. Not offered 1958 Examination of the causes and results of the Protestant Revolt and the Counter-Reformation. The development of Protestantism and Roman Catholicism. The contemporary Christian scene; modern theological movements; the younger churches; the Ecumenical Movement. Readings in the contemporary documents.

423. American Christianity. (3-0) Cr. 3. Alt. S. Not offered 1958

490. Government and Agriculture. (3-0) Cr. 3. F. Prerequisite: 315. Agriculture as a major interest in American life; tasks of government as umpire of conflicts among pressure groups; organization and operation of governmental administrative agencies serving agriculture; examination of court decisions involving agriculture; analysis of farm programs.

491. Agricultural Administration. (3-0) Cr. 3. W. Prerequisite: 490 or equivalent. Analysis of the major problems in administering public agricultural programs, including federal-state-local relations; coordination of programs; adapting national programs to local needs; and securing democratic and effective farmer participation in these programs.

495. Special Problems. Cr. 2 to 5. F.W.S. Prerequisite: Permission of the head of the department. National, state, and local governments; governmental reorganization; tax revision; congressional investigation; labor relations; the regulation of commerce, industry and agriculture; current party problems.
HOME ECONOMICS

HELEN R. LEBARON, Ph.D., Dean of Home Economics
JULIA M. FALTINSON, M.S., Assistant Dean
IRENE HAYNES BUCHANAN, M.S., Placement Director

Opportunities for Undergraduate Study

For undergraduate curricula in home economics leading to the degree of Bachelor of Science, see page 86.

Courses Primarily for Undergraduate Students

105. Orientation to Home Economics. (3-0) Or. 1. F.W.
- History and scope of home economics
- Planning a college program
- Information regarding various majors and professions

400. Professional Relations. Required. F.W.
- Procedure in securing positions
- Employer-employee relationship
- Senior classification

HOME ECONOMICS EDUCATION

FLORENCE A. FALLGATTER, M.A., Head of Department

PROFESSORS: Hester Chadderdon, Ph.D.; Dagmar Hildegarde Johnson, Ph.D.; Mary S. Lyle, Ph.D.; Mattie Pattison, Ph.D.

ASSISTANT PROFESSORS: Gladys Grabe, M.S.; Blanche R. Miller, M.S.; Merlene E. Nelson, M.S.; Emma Jean Selby, M.S.


Opportunities for Undergraduate Study

For undergraduate curriculum in home economics education leading to the degree of Bachelor of Science, see page 89.

The curriculum in home economics education is planned for those who wish to prepare for teaching in junior and senior high schools. By utilizing some elective credits for certain courses, this curriculum also prepares for the home economics extension service. A quality point average of 2.1 must be maintained for all education courses after V.Ed. 204.

For details of state teacher certification, see Vocational Education, page 239. The requirement of at least 23 quarter credits in each of two subject matter fields or of 30 quarter credits in one field in addition to home economics should be noted.

For description of courses in vocational education, see Department of Vocational Education, page 238.

Vocational Education Qualifications

The Department of Home Economics Education is approved by the State Board for Vocational Education for the training of teachers of homemaking who desire to teach in the federally-aided schools of the state.

Preparation for Home Economics Extension Service

Students in Home Economics will have a strong basic background for home economics extension service. For specific preparation V.Ed. 466 or 467 should be included. The following suggested electives should be considered in consultation with the assistant director in charge of home economics: Soc. 364, 464; Sp. 312; T.Jl. 225; Engl. 404; H.Mgt. 414, 415; H.Eq. 208; I.Mgt. 380. Refer to pages 89 and 255.

Summer employment as assistants to county extension home economists provides valuable experience for the potential extension worker. It should be considered between the junior and senior years.
Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in home economics education and minor work to students taking major work in other departments.

Students expecting to do major work should have fundamental knowledge of psychology, education, sociology and home economics. The exact requirements will depend upon the field of work the student expects to pursue.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Courses Primarily for Undergraduate Students

405. Observation of Teaching. (1-3) Cr. 2. F.W.S.  
Prerequisite: Credit or classification in V.E. 305.  
Guided observation of teaching as a basis for applying educational principles to homemaking instruction. Field trips to typical homemaking departments in Iowa high schools. Observation of adult classes. Preparation for applying educational principles to homemaking instruction. Field trips to typical homemaking departments in Iowa high schools. Observation of adult classes. 

406. Methods of Teaching Home Economics. (2-0) Cr. 2. F.W.S.  
Prerequisite: 405, V.Ed. 305.  

407. Supervised Teaching in Home Economics. Cr. 8. F.W.S.  
Prerequisite: C.D. 480, F.&N. 303, Sp. 811, 3rd & 4th year, 2 credits in education and 2 credits in home economics. Supervised teaching in public schools for periods of six or twelve weeks. Advance reservation with head of department required.

Courses for Advanced Undergraduate and Graduate Students

504. Special Topics. F.W.S.  
Prerequisite: 406.  
A. Adult Education. Miss Lyle  
B. Administration. 

Courses for Graduate Students

605. Home Economics Curricula. (5-0) Cr. 3. F.  
Prerequisite: 15 credits in education and teaching experiences or permission of instructor. Miss Pattison  
Bases and techniques of curriculum building applied particularly in home economics for secondary schools and colleges. 

606. Technique of Supervision. (5-0) Cr. 3. F.  
Prerequisite: 15 credits in graduate courses in home economics education. Functions of home economics supervision in a student teaching center, a city system and a state department of education. Techniques, plans and evaluation of supervision. 

607. Survey of Present-Day Trends in Teaching Home Economics. (3-0 or 3-0) Cr. 2 or 3. S.S.  
Prerequisite: Teaching experience. Analysis of offerings and procedures in educational programs for home and family living for all age groups. 

608. Workshop. Cr. 1 to 3. S.S.  
Prerequisite: Permission of instructor. Concentrated group study of problems in fields of home economics education indicated in sections A to E. Sections offered will vary from year to year. 

408. Methods in Adult Homemaking Education. (2-2) Cr. 3. W.S.  
Prerequisite: Credit or classification in 405.  
Organization of material, selection, use and evaluation of teaching techniques suited to group work with adults and to media of informal education in homemaking. Observation of adult classes. Participation in organizing and teaching adult groups.

409. Planning and Evaluating the Home Economics Program. (2-2) Cr. 3. W.S.  
Prerequisite: 407.  
Planning for secondary school programs with special emphasis on curriculum and evaluation. 

415. Principles of Education for Dietitians. (2-0) Cr. 2. W.  
Prerequisite: F.&N. 305.  
Bases for curriculum planning of dietetic units offered nurses, patients, employers, doctors and dentists.

O. Curriculum. Miss Pattison  
D. Evaluation. Miss Chadderdon  
E. Extension.  
F. Supervision. 

A. Adult Education. Miss Lyle  
B. Evaluation. Miss Chadderdon  
C. Home Economics Curriculum. Miss Pattison  
D. Supervision and Administration. E. Special. 

609. Adult Education in Family Life. (3-0) Cr. 8. SS. Alt. W. Offered 1958. Miss Lyle  
Prerequisite: 408 or experience in adult education. 8 credits in psychology and permission of instructor. Philosophy of family life education for adults. Interests and needs of various age and social groups. Methods and materials effective in group work and in educational media such as radio and television. Findings of latest research in the field of adult and family life education. 

610. Seminar. Credit 1 each quarter. Misses Chadderdon, Patterson 

612. Evaluation in Home Economics. (2-0) Cr. 2. W.  
Prerequisite: 12 credits in education or permission of instructor. Miss Chadderdon Selection and construction of evaluation devices. Their use and interpretation in home economics programs. 

614. Research.  
Misses Chadderdon, Lyle, Patterson
HOME MANAGEMENT

MARGARET I. LISTON, Ph.D., Head of Department

ASSOCIATE PROFESSORS: Marie A. Budolfson, M.S.; Naomi D. Shank, B.S.
ASSISTANT PROFESSORS: Gordon E. Bivens, M.S.; Enid E. Whade, M.S.
INSTRUCTORS: Jean Engler, B.S.; Lorna Oelrich, B.S.; Julia Pond, M.A.; Carol Jean Robinson, B.S.; Helen Tucker, B.A.

Opportunities for Undergraduate Study

For undergraduate curriculum in home management leading to the degree of Bachelor of Science, see page 90.

Students with a major in home management may elect a sequence of courses to prepare for employment in home economics extension service, social welfare, and consumer marketing or other business positions for which backgrounds in home management and social science are desired. Those interested in further information about employment opportunities and curriculum requirements should consult the head of the department.

The home management curriculum also gives valuable preparation for homemaking and for graduate study leading to college teaching and research.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science, and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a minimum of six quarter hours in each of the following: applied art; textiles and clothing; economics and sociology; food and nutrition, including elementary foods and meal planning; one course each in child development and general psychology, home management, household equipment, physics and residence in a home management house.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only: 414, 415, 488.

Courses Primarily for Undergraduate Students

(3-0) Cr. 3. F.W.S.
Use of time, energy, money and other resources for the attainment of individual and family goals.

414. Economic Functions of the Family.
(Ec. 414) (3-0) Cr. 3. F.
Prerequisite: 12 hours of economics, sociology and psychology.
Family characteristics and functions related to resources available and standards of living sought. Theoretical bases for family decision-making. Consideration of public policies and programs of special concern in relation to availability and use of resources by families.

415. Consumers in the Market.
(Ec. 415) (3-0) Cr. 3. F.W.
Prerequisite: Ec. 242.
Consumers in the marketing system-market organization; consumer-retailer relationships; evaluation of sources of information for consumer buyers; programs for consumer protection. Field trip.

474. General Home Management.
(3-0) Cr. 3. F.W.S.
Prerequisite: Ec. 242. Soc. 134 or permission of instructor.
Decision-making related to the use of resources for attainment of individual and family goals.

475. Home Management House.
Cr. 4. F.W.S.
Prerequisite: C.D. 236, F & N 303 and classification in 474.
Six weeks residence with actual experience in decision-making, homemaking and group relationships; arranged individual and group conferences. Advance reservation with head of department required.

478. Family Finance.
(Ec. 488) (3-0) Cr. 3. S.
Prerequisite: Credit or classification in 474 or permission of instructor.
Planning, controlling and evaluating family income and expenditures with special reference to consumer credit, insurance and investment.

Courses for Advanced Undergraduate and Graduate Students

515. Consumer Market Analysis.
(Ec. 515) See Economics.

516. Standards of Living.
(Ec. 516) See Economics.

517. Economics of Housing.
(Ec. 517) See Economics.

520. Food Economics.
(Ec. 520) (3-0) Cr. 3. Alt. S. Not Of.

faced 1968
Prerequisite: 9 credits in economics.
Analysis of factors related to trends in world population growth and food consumption. Economic, psycho-social and managerial aspects of food in family life. Evaluation of public policies and programs with respect to food consumption.
Courses for Graduate Students

614. Research. F.W.S.
Miss Liston

619. Social Science Methods in Home Economics Research. (3-0) Or. 3. W.
Prerequisite: 414, or permission of instructor. Miss Liston
Social science principles as tools of home economics research. Methods and techniques of investigation. Design and interpretation of studies in fields related to students' interests.

677. Seminar. Credit as arranged. F.W.S.
Miss Liston

688. Advanced Family Economics. (Ec. 688) (3-0) Or. 3. S.
Prerequisite: 414 and credit or classification in 488. Miss Liston
Family property accumulation and control related to the family life cycle. Problems in measurement of family income and wealth. Factors which influence income expenditure relationships. Programs for improving adequacy and security of income.

Horticulture

Ernest S. Haber, Ph.D., Head of Department

Professors: August E. Kehr, Ph.D.; John P. Mahlstede, Ph.D.; Harry E. Nichols, M.S.; Bethel S. Pickett, M.S.; Julian S. Schilletter, Ph.D.; Emil C. Volz, M.S.
Associate Professors: Arthur E. Cott, M.S.; Harvey L. Lantz, M.S.
Assistant Professors: Griffith J. Buck, Ph.D.; Ervin L. Deniseth, Ph.D.; Carroll C. Doll, M.S.; Kenneth W. Johnson, Ph.D.; Lewis E. Peterson, B.S.; Charles H. Sherwood, Ph.D.; Benjamin F. Vance, B.S.
Instructor: Donald B. White, B.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in horticulture leading to the degree of Bachelor of Science, see page 53.

The curriculum in horticulture is designed for students interested in fruit growing, vegetable growing, flower growing, vegetable and flower seed production, nursery management and turf management. The four year curriculum has five options (1) fruit crops, (2) floriculture, (3) vegetable crops, (4) nursery management and (5) turf management. The curriculum is designed to prepare the student for work as an owner, operator or manager of an orchard, vegetable or flower growing enterprise, florist shop or nursery; field man or production supervisor for canning company, seed company, nursery or florist; plant breeder for seedsman or canner; greenskeeper or turf consultant for golf courses, playing fields and parks; research worker in commercial work, such as a canning company, seed company, nursery or florist; teacher, research and extension worker in a college or university and in government work; for graduate work leading to advanced degrees in horticulture and related fields.

The curriculum provides a liberal allowance of elective credits to be filled with courses selected by the student.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in horticulture with the option of specializing in fruit crops, vegetable crops, floriculture and nursery crops and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of courses covering the general field of horticulture or botany and the underlying sciences.

Students with major problems in fruit crops, floriculture, vegetable crops, or nursery crops should present the equivalent of 15 quarter credits (10 semester hours) of undergraduate work in horticulture, botany, landscape gardening or agronomy. The student should also have a working knowledge of inorganic and organic chemistry, general botany and soils equivalent to the requirements outlined in the general curriculum for horticultural students at this institution.
Students taking major work in horticulture will usually take minor work in agronomy, genetics, botany (physiology, pathology, cytology, or morphology), entomology, statistics or chemistry.

Open to graduate students for minor only: 415, 434, 444, 446, 447, 465.

Courses Primarily for Undergraduate Students

105. Greenhouse and Nursery Management. (0-6) Cr. 2. W.
Management of a commercial floral greenhouse, and the management of a mail-order and sales-yard nursery. Trips to greenhouses, nurseries and markets. Open for credit to Winter Quarter Horticulture Pre Home Economics students only.

110. Introduction to Horticulture. (1-0) Required. F.
Introduction of first-year students to horticulture field; assistance in learning how to use facilities of the college and department to advantage.

114. General Horticulture. (2-2) Or. 2. F.W.S.
Horticultural enterprises, commercial and home; structures, functions, growth, propagation, cultivation, pruning, training, and protection of horticultural plants; harvesting and storing their products.

116. Home Floriculture and Flower Arrangement. (1-2) Or. 2. F.W.S.
A. For Home Economics students only.
B. For Winter Quarter students only.
Principles and methods of growing house plants and garden flowers and arrangement of cut flowers in the home.

154. Greenhouse Methods. (2-2) Or. 2. W.
Principles and methods of plant-growing under glass; nutritive solution culture of greenhouse plants.

164. Vegetable Crops. (3-0) Or. 8. S.
Areas of production and culture of more important vegetable crops. Special emphasis on potatoes.

214. Plant Propagation. (2-2) Or. 3. W.
Prerequisite: 114 or Bot. 101. Fundamental principles underlying sexual and asexual propagation of plants and practice in reproducing plants by use of seeds, leaves, stems, or roots.

224. Grapes and Small Fruits. (2-2) Or. 3. S.
Principles and practices involved in handling home and commercial plantings of vines and smaller fruiting berries, bush fruits and miscellaneous small fruits.

244. Garden Flowers. (2-2) Or. 3. S.
Description, nomenclature, classification, and culture of important garden flowers including annuals, perennials, bulbs, flowering vines, rock and water garden plants.

318. Turf Management. (2-2) Or. 3. Alt. F.S. Offered 1957-58
Establishment and maintenance of turf for lawns, golf courses, athletic fields and playground areas. Emphasis on soil, fertiliser, seeding and water requirements.

316. Nursery Methods. (2-2) Or. 3. S.
Prerequisite: 214.
Equipment, including land, packing sheds, storage sheds, frames, glass houses, irrigation devices; large scale propagation, transplanting and management of plants; relations to other fields of horticulture; protection of nursery plants from climatic, disease, and insect difficulties.

324. Grading and Judging Horticultural Products. (0-4) Or. 2 each time elected. F.W.
Open to senior students only.
Grading and judging horticultural crops and products; requirements of produce inspection services; staging horticultural exhibits.

344. Commercial Floral Design. (1-4) Cr. 3. Alt. W. Offered 1958
Prerequisite: 154, 244.
Principles and methods of cut flower arrangement; interior decoration; exhibiting and judging flowers and plants. Open only to junior and senior students specializing in floriculture.

366. Commercial Vegetable Crops. (3-0) Cr. 3. Alt. W. Offered 1959
Production of crops on commercial scale in truck farming and market gardening.

401, 402, 403. Seminar. (1-0) Cr. 1 each. yr.

414. Marketing Horticultural Products. (4-0) Cr. 4. W.
Prerequisite: 114.
Areas of production of horticultural crops, standardization, inspection, transportation, storage, price trends, agents of distribution, market news service, foreign markets, cooperative markets.

(3-0) Cr. 3. F.W.
Prerequisite: 114 or permission of instructor.
Application of scientific principles to horticultural techniques in selecting, propagating, planting, protecting, pruning, and growing horticultural plants.

421, 422. Commercial Orcharding. (2-2) Or. 3 each. F.S.
Prerequisite: 114.
Pomological regions, propagation, planting, varieties, culture, pest control, harvesting and storage.

424. Tropical and Sub-Tropical Fruits. (2-0) Cr. 2. Alt. W. Not Offered 1958
Discussion of propagation, growing, shipping, and selling of tropical and subtropical fruits.

434. Systematic Fruit Crops. (2-2) Or. 2. F. Offered 1957
Prerequisite: 114
Description, nomenclature, and classification of tropical and subtropical fruits; critical descriptions and identifications, with special reference to relationships and classification of varieties.

444. Aquatic Horticulture. (2-2) Or. 3. Alt. W. Offered 1958
Prerequisite: 114.
Identification, classification, propagation, and culture of palms, ferns, orchids, waterlilies, and other greenhouse exotics.

446. Commercial Floriculture. (3-0) Cr. 3. Alt. W. Offered 1959
Prerequisite: 154, 244.
Identification, classification, propagation, and culture of palms, ferns, orchids, and other greenhouse exotics.

456. Systematic Vegetable Crops. (2-0) Or. 2. Alt. F. Offered 1958
Prerequisite: 154.
History and classification of vegetable species, groups, types and varieties, and development of classifications based upon relationships.
Courses for Advanced Undergraduate and Graduate Students

510. Special Topics.
Cr. 2 to 6 each time taken.
Prerequisite: A major or minor in horticulture.

518. Breeding of Horticultural Plants.
(3-0) Cr. 3. Alt. E. Offered 1967
Prerequisite: Gen. 800. Status; progress; application of principles of genetics to improvement of horticultural crops.

564. Canning Crops.
(3-0) Cr. 3. Alt. W. Not offered 1958
Prerequisite: 114. Mr. Haber
Production of canning crops, study of seed strains, seed production, acreage contracts, grading.

Courses for Graduate Students

600. Research.
A. Floriculture. Mr. Volz
B. Fruit crops. Messrs. Denlsen, Lents
C. Vegetable Crops. Mr. Haber
D. Propagation. Messrs. Haber, Volz

603. Experimental Horticulture.
(3-0) Cr. 2. Alt. W. Offered 1958
Mr. Haber
Organization, support, training, publication and relationship in horticultural research.

604. Graduate Conference.
Cr. 1 each time elected. F.W.S.
Mr. Haber

690. Systematic Horticulture I.
(3-0) Cr. 5. Alt. E. Not offered 1967
Prerequisite: Gen. 800 and 10 credits in horticulture. Messrs. Haber, Volz
Classification, origin and genetics of vegetable crops and herbaceous and woody plants.

691. Systematic Horticulture II.
(3-0) Cr. 5. Alt. W. Not offered 1958
Prerequisite: 10 credits in horticulture and elementary genetics. Mr. Volz
Identification, classification, propagation and origin of greenhouse exotic plants; description and nomenclature of native and subtropical fruits.

HOUSEHOLD EQUIPMENT

ELIZABETH BEVERIDGE, M.S., Head of Department

PROFESSOR: Louise J. Peet, Ph.D.
ASSOCIATE PROFESSORS: Lydia L. Inman, M.S.; Helen J. VanZante, Ph.D.
INSTRUCTORS: Eloise Lorch, M.S.; Mary S. Pickett, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in household equipment leading to the degree of Bachelor of Science, see page 90.

As homes become more dependent on modern appliances there is an ever increasing need for trained home economists to help in the development and promotion of equipment. Entirely new types of appliances and new features of familiar types must be interpreted to homemakers if they are to be used effectively. Equipment training is an asset in the management of the modern home and graduates are finding many opportunities for combining homemaking and professional work in this field. Manufacturers and distributors of equipment, and home service departments of gas and electric companies need equipment-trained home economists to aid homemakers in the selection, use and care of appliances. Manufacturers also need home economists in their development and testing laboratories to represent the woman’s viewpoint as new designs are worked out. Further opportunities for careers are found in government and commercial research laboratories, in college teaching and extension work.

Students interested in taking a combination course in household equipment and science should follow the curriculum on page 87. Those interested in household equipment and television follow the curriculum suggestions on page 91.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science, and minor work to students taking major work in other departments. Work may be taken for the degree of Doctor of Philosophy as a divided major with departments offering work in related fields for this degree.

Prerequisite to major graduate work in household equipment is credit in beginning food courses, 24 quarter credits in physics (mechanics, electricity, heat), chemistry (general, organic, and quantitative method), and household equipment. It is recommended that the student should have a general background in home economics, but students with fundamental training in chemistry, physics, and bacteriology may be accepted.
Students taking major work in household equipment will usually select their minors from economics, food and nutrition, institution management, or physics.

Open to graduate students for minor only: 406, 414, 422, 445.

Courses Primarily for Undergraduate Students

154. Fundamentals of Household Equipment. (2-4) Cr. 3. F.W.S.
Prerequisite: Phys. 106 or equivalent.
Simple application of electricity in the home; characteristics, use and care of common materials; principles of selection, use and care of household appliances; introductory principles of kitchen planning and home lighting.

208. Small Equipment. (2-4) Cr. 3. W.
Prerequisite: 154.
Safe use and care of electrical and non-electrical small equipment for food preparation, equipment for floor care and general home comfort. Experimental opportunities.

315. Television Demonstration Techniques. (2-4) Cr. 3. S.
Prerequisite: Sophomore classification, Sp. 811 and two quarters of television workshop.
Reservation required.
Experience in planning and presenting demonstrations for television audiences.

320. Selection and Performance of Household Equipment. (2-3) Cr. 3. S.
A general course for students not registered in home economics. Principles of selection and performance of home equipment. Arrangements to promote optimum service from equipment. Special study of one or two of the following: home wiring, lighting, plumbing, heating.

Prerequisite: Junior classification. Observation for one week in manufacturing plants, testing laboratories and lighting institutes. Required in Household Equipment major.

404. 405. 406. Equipment Mechanics. (2-4) Cr. 9 each. F.
Theory of electric circuits for measuring characteristics of household appliances. Use of electrical testing equipment for determining operating characteristics of heating appliances.
405. Use of electrical testing equipment for determining operating characteristics of motor-driven appliances. Use of indicating and recording instruments for measuring temperatures in oven refrigerators. Measurements of thermal efficiency of selected appliances.
406. Prerequisite: 405. F.
Special emphasis on comparative accuracy and utility of different laboratory procedures for evaluating performance of appliances.

407. Gas and Electric Cooking Appliances. (2-4) Cr. 3. S.
Prerequisite: 405.

408. Kitchen Planning and Laundering Equipment. (2-4) Cr. 3. S.
Prerequisite: 404.
Planning of kitchens and laundries for convenience, comfort and contribution to family living; problems of installation, remodeling. Principles of home laundering: water softening; operation of modern laundering equipment.

409. Refrigeration and Home Lighting. (2-4) Cr. 3. F.
Prerequisite: Credit or classification in 405.
Operating time, energy consumption and internal temperature of refrigerators under varying conditions of use; desirable storage procedures; packaging methods for frozen foods. Factors affecting efficiency of lamps and light reflection in a room; special projects on wiring and lighting design for the home, and on decorative lighting.

414 Special Problems. Credit as arranged. F.W.S.
Prerequisite: 6 credits in household equipment and permission of head of department.

421. Training in Demonstration Techniques. (2-4) Cr. 3. W.
Prerequisite: 154, Sp. 311, credit or classification in F.&N. 303 and senior classification.
Experience in planning and presenting direct audience demonstrations. Techniques for presentation before various size groups from small clubs to large cooking school audiences. Reservation required.

422. Home Economist in Business. (3-0) Cr. 3. W.
Prerequisite: Ec. 242 and senior classification.
The home economist in the business organization: techniques of supervision; business procedures; professional responsibilities and ethics; public relations.

425. Seminar. (2-0) Cr. 2. S.
Prerequisite: 406.
Recent developments in equipment field.

445. Advanced General Equipment. (2-2) Cr. 3. F.W.S.
Prerequisite: 154.
Equipment for adequate home wiring, home plumbing, heating and air conditioning. Units may be selected from new developments in the following: Sewing machines, automatic laundry equipment, ranges, refrigeration, kitchen planning and floor care.

Courses for Advanced Undergraduate and Graduate Students

514. Special Topics. Credit as arranged. F.W.S.
Prerequisite: 405 and one year of general physics.
A. Gas and Electric Cooking Appliances
B. Refrigeration
C. Lighting
D. Equipment for Cleaning
E. Small Equipment
F. Advanced Laboratory. Miss Beveridge, Mrs. Feat, Mrs. Van Zante
Courses for Graduate Students

604. Seminar. Credit as arranged. F. Miss Beveridge

605. Advanced Equipment Testing Techniques. Credit as arranged. F.W.S. Prerequisite; 406, and 6 credits in household equipment 500 courses. Phys. 211, 212, 218. Miss Beveridge

A series of non-sequence courses taught as needed.
A. Testing apparatus.
B. Gas and Electric Range Testing.
C. Refrigeration Technology.

614. Research. Miss Beveridge

HYGIENE

JOHN G. GRANT, M.D., Head of Department

PROFESSOR: Gail A. McClure, M.D.
ASSOCIATE PROFESSOR: Lynn Dodge, M.D.
ASSISTANT PROFESSORS: Pak-Chue Chan, M.D.; Cecil V. Hamilton, M.D.

Opportunities for Undergraduate Study

For the Student Health Service of the department, see page 11.

The purpose of this department is to conserve and improve the health of students while in college and to give them such training and instruction as will enable them to maintain high health standards for themselves and for the community after leaving college.

Courses Primarily for Undergraduate Students

204. Health Education. (3.0) Cr. 3. F. Health facts and practices.


INDUSTRIAL EDUCATION

For description of courses, see Department of Vocational Education, see page 242.

INDUSTRIAL ADMINISTRATION

WILLIAM H. SCHEMPFR, J.D., Head of Department

PROFESSOR: William H. Thompson, Ph.D.
ASSOCIATE PROFESSORS: Donald W. Brown, C.P.A.; Ralph S. Novak, Ph.D.; Harry L. Shadle, Ph.D.
ASSISTANT PROFESSORS: James D. Benson, M.A.; Allen B. Bess, M.A.; Carroll H. Kinker, C.P.A.
INSTRUCTOR: Ray H. McClary, M.A.

Opportunities for Undergraduate Study

For the undergraduate groups requirements in the curriculum in the Division of Science, major in industrial administration leading to the degree of Bachelor of Science, see page 97.

The department of Industrial Administration provides training for those who are interested in business and industry, having as their goals either private business enterprise or ultimate business management positions. It is the purpose of the department to provide interrelated training in the basic recognized business areas of accounting (managerial, cost and tax), business law, business forecasting, business organization, finance, industrial risks, marketing and procurement, regulation of business, transportation and traffic management. Instruction in the areas of industrial relations, employer-employee relations, production management and personnel supervision is available, as supplementary to our program of training, in the departments of Economics, General Engineering and Psychology.

The department presents the opportunity of preparation for the study of law by completion of three years of this curriculum, followed by one year in a recognized college of law, after which the degree of Bachelor of Science with a major in industrial administra-
340. Industrial Marketing I. (3-0) Or. 3. F.W.S.  
Prerequisite: Ec. 242.  
Marketing functions, institutions and policies as applied to the industrial market.

350. Business Finance. (3-0) Or. 3. F.S.  
Prerequisite: Ec. 241 or equivalent.  
Principles of financial organization and management. Types of corporate securities and financial management of new corporations and reorganizations.

365. Business Law I. (3-0) Or. 3. F.W.S.  
A. For students in engineering.  
B. For students in science and home economics.  
Fundamental principles of law as applied to business transactions and business relationships.  
C. For students in agriculture.  
D. For students in science and home economics.  
Ownership and management organization; relationship between government and business.

366. Business Law II. (3-0) Or. 3. S.  
Prerequisite: 865 or consent of instructor.  
Sales and negotiable documents of title; security relationships; credit instruments.

368. Business Organization and Public Regulation. (3-0) Or. 3. F.W.  
Prerequisite: 3 credits in Principles of Economics.  
Ownership and management organization; relationship between government and business.

371. Industrial Accounting.  
(3-0) Or. 3. F.W.S.  
Survey of theory and procedure of general accounting; introductory survey of cost accounting objectives and procedures. A terminal course for engineers not planning further study in accounting. This course does not meet prerequisite for 865 or 480.

372. General Accounting. Or. 4. F.W.S.  
A. For students in engineering.  
Emphasis upon managerial control aspects. The course serves as a prerequisite for 480.  
B. For students in home economics. (4-0) F.W.  
Emphasis upon food service and institutional applications.  
C. For students in dairy and food industries. (3-3) F.  
Emphasis upon accounting applications to dairy enterprises.

384. Accounting I. (2-4) Or. 4. F.W.S.  
Introduction to theory and procedure of general accounting. Emphasis upon development of accounting reports on an accrual basis through transaction analysis and summarization. Introduction to controlling accounts and special journals. Designed primarily for students who contemplate completing the basic accounting sequence.

*Only one of the following courses may count toward graduation: 371, 372, 384.

386. Accounting II. (2-8) Or. 3. W.S.  
Prerequisite: 384 or 372 with permission of instructor.  
Capital and surplus analysis; introduction to financial accounting concepts as they relate to receivables, inventories and fixed assets; partnership accounting techniques and problems.

388. Accounting III. (2-2) Or. 3. F.S.  
Prerequisite: 385.  
Accounting transactions and introduction to accounting theory; application of valuation principles; interpretation of financial statements.

(8-0) Or. 3. W.S.  
Prerequisite: One course in accounting.  
Survey of income tax problems with emphasis upon transaction planning and return preparation for individuals.

440. Industrial Marketing II.  
(8-0) Or. 3. F.W.  
Prerequisite: 340.  
Extension of 340 with emphasis upon procurement in the industrial market; application of principles to selected cases.

443. Marketing Management.  
(3-0) Or. 3. S.  
Prerequisite: 340.  
Formulation of marketing policies; administration of marketing operations; application of principles to representative problems of selecting, training, organizing and managing personnel.

445. Investments. (3-0) Or. 3. F.W.  
Prerequisite: Ec. 242. I. Ad. 850, 384 recommended.  
Survey of prices and yields; essential investment features of various corporate securities—risk, income, control; methods of testing bonds and stocks; individual investment programs.

460. Principles of Transportation.  
(3-0) Or. 3. F.W.  
Prerequisite: Ec. 242 or equivalent.  
Historical development and current role of transportation in the United States. An analysis of the problems and public policy pertaining to all agencies of transportation with emphasis directed toward the railroad industry.

462. Air Transportation. (3-0) Or. 3. S.  
Prerequisite: Ec. 242 or equivalent.  
Domestic and foreign regulation of commercial air transportation. Economic and physical characteristics of common, contract and private air carriers as compared to those of surface carriers. Present and potential traffic patterns of air transport carriers.

463. Highway Transportation.  
(3-0) Or. 3. W.  
Prerequisite: Ec. 242 or equivalent.  
Types and character of the present commercial highway services. Appraisal of the competitive relationships between the different classes of motor carriers and other agencies of transportation. Current problems in the administration and financing of the national highway system.

In cooperation with the department of Architecture and Architectural Engineering a program of study is provided for those who are interested in business as related to the building and related industries. This program leads to the degree of Bachelor of Science, with a major in industrial administration and minor in architecture. For particulars, the head of either department should be consulted.

Courses Primarily for Undergraduate Students
465. Traffic Management. (3-0) Cr. 3. S.
Prerequisite: 460.
Organization, functions and duties of the traffic management departments in small and large industries. Shipment/traffic relationship; shipping procedures; selection of transportation media; freight classification; freight rate tariffs. Economic implications of transit privileges, routing, warehousing and demurrage. Includes transportation by rail, motor, air, water, pipeline, express and parcel post. Field trips to industrial and carrier installations.

467. Public Utilities. (3-0) Cr. 3. S.
Prerequisite: Ec. 242 or equivalent.
Nature of the public utility concept. Theories of valuation and rate of return; plant operation and utilization; capital structures. Division of regulatory control between state and national government. Private and public ownership of utilities in the United States.

470. Business Forecasting. (3-0) Cr. 3. F.W.S.
Prerequisite: 384, 350, Ec. 242.
Methods employed in estimating the probable degree and direction of business change with a view to reducing business risk.

474. Advanced Business Finance. (3-0) Cr. 3. S.
Prerequisite: 350, 384.
Promotion and expansion of business enterprise. Procedure and planning of the internal financial control of business. Emphasis upon the financial problems of small business enterprise.

475. Investment Analysis. (3-0) Cr. 3. S.
Prerequisite: 445.
Practices in analyzing and evaluating securities, primarily on companies; cyclical movements of security prices. Methods of investment used by various financing institutions.

480. Cost Accounting. (2-4) Cr. 4. F.W.S.
Prerequisite: 384 or 372A; or 372C with permission of instructor.
Elements of cost in industrial accounting; preparation of cost reports; job order and process cost accounting methods; introduction to standard costs. Field trips.

481. Advanced Cost Accounting. (2-2) Cr. 2. S.
Prerequisite: 480 or permission of instructor.
Development of standard cost procedures and reports; manufacturing cost control as provided by analysis of off-standard performance. Field trips.

484. Internal Auditing. (2-2) Cr. 3. S.
Prerequisite: 386.
Principles of internal check and its relationship to accounting systems and business procedures; the purpose and objectives of internal auditing; design of internal audit program; application of auditing principles to specific accounts and activities. Field trips.

486. Industrial Market Analysis. (3-0) Cr. 3. S.
Prerequisite: 840.
Development of procedures and analysis techniques for a quantitative and qualitative determination of market potentials through selected projects.

490. Industrial Flakes. (3-0) Cr. 3. W.
Prerequisite: 885.
Risks of modern industry; shifting of industrial risks through the insurance technique; characteristics of mutual and stock companies. Estimations of insurable costs.

495. Accounting IV. (3-0) Cr. 3. W.
Prerequisite: 886.
Accounting theory and accounting application; accounting systems and machine techniques; presentation of managerial importance of future planning through accounting. Field trips.

499. Special Problems. Cr. 1 to 5. F.W.S.
Prerequisite: Senior classification and permission of head of the department.

INDUSTRIAL ENGINEERING

Joseph K. Walkup, B.M.E., I.E., Head of Department

Professors: Forest C. Dana, C.E.; Lawrence R. Hillyard, M.S.; Irwin W. Oest, M.B.A.
Associate Professors: Harold A. Cowles, Ph.D.; Jack P. Mills, Ph.D.


Opportunities for Undergraduate Study

For undergraduate curriculum in industrial engineering leading to the degree of Bachelor of Science, see page 75.

The Industrial Engineering curriculum affords essential training to those who have strong aptitude and interest in engineering and a potential capacity for management. The professional services performed by Industrial Engineers include plant layout and design, methods planning, work management, quality control, production control, cost analysis, sales engineering, personnel supervision and management. These services are rendered in fields including all types of manufacturing industries, service industries, distribution organizations, and governmental service.

The curriculum includes in addition to the fundamental engineering sciences, a carefully selected sequence of courses in electrical engineering, mechanical engineering, mechanics, industrial administration, and industrial engineering. Limited opportunities through elective courses are available for further study in other fields of engineering or management.
Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in industrial engineering and in engineering valuation and for the degree of Doctor of Philosophy in engineering valuation, and minor work to students taking major work in other departments. Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution.

Open to graduate students for minor only: 362, 404, 407, 421, 425, 426, 432, 436, 455, 462.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1-0) Required. S. Lecturers and conferences designed to aid the freshman student to adjust himself both in his course and in college environments.

104. Engineering Problems. (1-2) Cr. 1. F.W. Prerequisite: Credit or classification in Math. 102C. Development of skills and orderly methods of solving problems; engineering forms and standards. Uses of slide rule, logarithms, graphic methods.

105. Engineering Problems. (1-2) Cr. 1. W.S. Prerequisite: 104 and credit or classification in Math. 102C. Development of skills and orderly methods of solving problems involving computations of an engineering character. Basic calculating techniques; longhand, slide rule and logarithms. Application of trigonometry and background mathematics to the solution of engineering problems.


108. Methods of Engineering Computations. (0-3) Cr. 1. F.W. Prerequisite: Transfer credit in Math. 103. Training in skills, standards and methods essential for engineering computations. To assist transfer students in adjusting to divisional standards.

213. Seminar. (1-0) Required. F.W.S. Required of all third quarter sophomore students. Required of senior college transfer students in the first quarter after transfer to the Industrial Engineering Department. May be taken concurrently with 811.

311. Seminar. (1-0) Required. F. 325. Summer Work. Cr. 3 each. Prerequisite: Advance approval of the head of the department. Approved summer work in industrial plants.

351. Industrial Organization. (3-0) Cr. 8. F.W.S. Prerequisite: Junior classification. Industrial tendencies, ownership, types of organization, the principles and methods of production control, inspection, motion and time study, wage systems, cost control and personnel relations in the coordination of an industrial organization.

362. Calculations and Graphic Methods. (3-0) Cr. 3. F.W. Prerequisite: Math. 212 and junior classification. Selective tabulation and analysis of mass data by graphic and selected statistical methods, graphic presentation of industrial engineering and management data.

373. Time and Motion Study. (3-3) Cr. 4. W.S. Prerequisite: 851, 362, M.E. 205. Principles and practice in stopwatch, micro-motion and standard data analysis of personnel and equipment. Standardization of methods, of operations and operation times. Statistical and empirical approaches.

400. Senior Inspection Trip. Required. F. Prerequisite: Senior I.E. classification. One week spent in industrial centers visiting and inspecting industrial plants.


407. Engineering Valuation. (3-0) Cr. 3. F.W.S. Prerequisite: EC. 241 and 3 Cr. of accounting. Concepts of value, original cost, and reproduction cost, property records, methods of estimating depreciation for valuation and accounting; intangible values, cost values, earning values, rate base, and valuation for taxation, rates, financing, insurance and sales.


425. Personnel Supervision. (3-0) Cr. 3. F.S. Prerequisite: Psych. 104. Problems relating to human contacts arising in the course of employment, with desirable approaches to their solution.

426. Personnel Management. (3-0) Cr. 3. S. Prerequisite: 425. Problems relating to personnel management, stressing organization and universally significant managerial functions, procedures and relationships.

432. Job Evaluation. (2-3) Cr. 3. F.S. Prerequisite: 378 or 455. Determining requirements of jobs, analysis for degree and extent of major job factors, weighing of factors, development of basic hourly rate curves, salary classifications, administrative procedures. Practice in description and evaluation.
Prerequisites: 404, 3 Cr. in accounting. Advanced engineering economic analysis; engineering, financial and intangible factors; capital budgeting; management decisions for expenditure of funds. Applications of capital recovery and physical plant replacement theories.

511. Legal Aspects of Engineering Administration. (3-0) Cr. 3. F.
Prerequisite: LAD 201 or I.E. 480, 351 and permission of instructor.

512. Taxation Aspects of Engineering Administration. (3-0) Cr. 3. S.
Prerequisite: 511, LAD 384 and permission of instructor.

513. Patent Aspects of Engineering Administration. (3-0) Cr. 3. S.
Prerequisite: LAD 365 or I.E. 480, 351 and permission of instructor. 511 desirable.

517. Engineering Valuation Practice. (2-8) Cr. 8. F.S.
Prerequisite: 407. Application of principles of engineering valuation including field work; preparation and pricing of inventories, valuations for utility rates, security regulations, condemnation, sales, estate settlements, and for determining fixed capital costs.

518. Depreciation Estimates. (3-0) Cr. 3. W.S.
Prerequisite: 407. Collection and analysis of retirement data. Techniques required 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.

532. Engineering Aspects of Wage Determination. (2-8 or 6) Cr. 3. S.
Prerequisite: 432 or permission of instructor. Mr. Walkup.

536. Theory and Principles of Work-Time Relationships. (2-8) or (8-0) Cr. 3 or 5. S.
Prerequisite: 436 or permission of instructor. Mr. Walkup.

545. Advanced Industrial Engineering. Cr. 3 to 5 each time elected. F.W.S.
Prerequisite: 851, 441 or approval of head of department. Mr. Walkup.

554. Management Science. (3-0) Cr. 3.
Prerequisite: 351 or equivalent, Math. 300, 314, Stat. 403.

594. Special Topics. Cr. 1 to 5 each time elected. F.W.S.
A. Management problems in engineering administration and layout; balancing operations and schedules; design of the manufacturing plant; structure of the organization and supervision; Control techniques; budgets and realization comparison.

594. Special Topics. Cr. 1 to 5 each time elected. F.W.S.
B. Management problems in personnel.
C. Management problems in industrial engineering. Mr. Walkup.

Courses for Advanced Undergraduate and Graduate Students
Courses for Graduate Students

601. Seminar. Required. F.W.S. Mr. Walkup

602. Depreciation Accountancy. Or. 2 to 6 each time elected. F.S. Prerequisite: 518 and I.Ad. 884 or equivalent.
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.

603. Court and Commission Practice. Or. 2 to 6 each time elected. W.S. A. Prerequisite: 517 and I.Ad. 460.

INSTITUTION MANAGEMENT

GRACE M. AUGUSTINE, Ph.D., Head of Department

PROFESSOR: Lenore M. Sullivan, M.S.
ASSOCIATE PROFESSOR: Marjorie M. McKinley, Ph.D.
ASSISTANT PROFESSOR: Jean M. Riggs, M.S.
INSTRUCTORS: Mabel Anderson, B.S.; Elsie A. Guthrie, M.S.; Doris J. Hittle, M.A.

Opportunities for Undergraduate Study

For undergraduate curriculum in institution management, leading to the degree of Bachelor of Science, see page 91.
The curriculum in institution management provides professional preparation for men and women interested in managerial positions in institution administration. Students may elect one of three majors: college food and housing administration, restaurant management, and school food service.
The major in college food and housing administration is planned to provide men and women with a general education plus professional preparation for the management of college and university student unions and residence halls. Basic courses in various aspects of administration are supplemented by laboratory experiences.
The major in restaurant management provides, in addition to a general education, basic work to prepare men and women for supervisory and executive positions in the restaurant industry. The fundamentals of large quantity food production and business management are presented.
The major in school food service offers preparation for administering school lunch programs in elementary and secondary schools. A general education and basic professional courses pertinent to this field are provided for those concerned with managing single or multiple school lunch units.
Training in large quantity food preparation and service is afforded through the Home Economics Tea Room. The food and house administration departments of the Memorial Union and College Residence Halls offer managerial experience to advanced students. A two or three day field trip to businesses related to institution food service will be offered alternate years and will be required of institution management majors.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science, and minor work to students taking major work in other departments.
Work may be taken for the degree of Doctor of Philosophy as a divided major with departments offering work in related fields for this degree.
Prerequisite to major graduate work is the completion of at least twenty-five quarter credits of undergraduate work in home economics, ten of which should be in institution management (large quantity cookery, purchasing, and equipment), and seven in food and nutrition (nutrition and dietetics, and meal planning). Fundamental training in institution accounting, chemistry, physics, and bacteriology is required.
The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only: 484, 485, 487.

Courses Primarily for Undergraduate Students

280. Group Food Service. (2-3) Cr. 3. F.S.
Standard techniques and procedures of quantity food preparation demonstrated and practiced in the laboratory. Menu planning for camp, church, community and some residence groups; determining quantities of food to be purchased.

380. Large Quantity Cookery. (2-6 or 3) Cr. 3. F.W.S.
Prerequisite: F.E.N. 205.
Standard methods of food production in quantity; menu planning for institutions; determination of food costs; experience in food service and advance reservation with head of department required.

Prerequisite: Junior institution management classification.
Study tour of quantity food service and house administration units and of related industries.

404. Seminar. (2-0) Cr. 2. W.
Prerequisite: Senior classification.

Courses for Advanced Undergraduate and Graduate Students

580. Experimental Quantity Cookery. (1-6) Cr. 3. S.
Prerequisite: 380 and permission of head of the department. Miss Sullivan.
Methods in quantity food production related to time factor, institution equipment, and proportions of ingredients.

585. Catering. (2-6) Cr. 4. F.W.S.
Prerequisite: 380 and senior classification. Miss Sullivan.
Special food preparation and service for parties, dinners, and teas. Historical background of sectional foods in the United States and laboratory preparation of these and foreign foods.

588. Special Topics. Credit as arranged. F.W.S.
Prerequisite: 484, 485. Misses Augustine, Sullivan

589. House Administration. (2-3) Cr. 3. W.
Prerequisite: 484 and senior classification.
Methods, procedures and operation of housekeeping departments in institutions. Field trips required.

Courses for Graduate Students

604. Seminar. Credit as arranged. F.W.S.
Miss Augustine

606. Institution Purchasing. (1-6) Cr. 3 each.
Prerequisite: 380 and senior classification. Miss Augustine.
Job analysis, labor policies, labor organization, personnel problems, and financial control.

607. Institution Administration. (3-0) Cr. 3. W.
Prerequisite: Permission of head of department. Miss Augustine.

608. Administration Problems. (1-6) Cr. 3. F.W.S.
Prerequisite: 487. Miss Augustine.
Solution of advanced administration problems through practice in College dining halls, Home Economics Tea Room and Memorial Union.

614. Research. Miss Augustine.

LANDSCAPE ARCHITECTURE

JOHN R. FITZSIMMONS, M.L.A., Head of Department

PROFESSOR: Ralph R. Rothacker, M.S.
ASSOCIATE PROFESSORS: A. Maurice Hanson, B.S.; Margherita Tarr, B.S.
ASSISTANT PROFESSOR: Thomas A. Barton, B.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in landscape architecture leading to the degree of Bachelor of Science, see page 56.

The curriculum in landscape architecture has as its objective training of students for
professional careers. In general this profession deals with the layout of land for economic use, with a definite regard for the natural and the man-made beauty of the resulting landscape. It includes the design, construction, planting and maintenance of residential properties, farmsteads, parks, cemeteries, school grounds, public and private institutions, subdivisions and town and regional planning, including recreational area design and other land planning problems.

In addition to training for general practice, the specialized fields of urban planning and domestic work offer varied vocational opportunities. Options are provided in the curriculum for these specializations. Students wishing to prepare for service as foremen of construction, planting, nursery landscape men and related positions may choose the domestic option.

Students preparing for city, town or regional planning should follow the urban planning option. Opportunities for Graduate Study

The department offers major work for the degree of Master of Landscape Architecture and minor work to students taking major work in other departments. The degree of Master of Landscape Architecture is granted upon the completion of one year of satisfactory resident graduate work and the acceptance of a thesis, after at least one full year of successful professional practice.

Students desiring to major in this department should present credits in landscape architecture substantially equivalent to those secured by undergraduate students in the curriculum in landscape architecture at this institution.

The department also offers work for the degree of Master of Science, major in town and regional planning. Students should present the equivalent of the requirements of this institution for the degree of Bachelor of Science in one of the following departments: architecture, civil engineering, economics and sociology, or landscape architecture.

The following courses are open for major graduate credit to graduate students.

Courses Primarily for Undergraduate Students

110. Technical Lecture. (1-0) Required. F.
Survey of landscape architecture and allied fields.

111. Landscape Architecture Drawing.
(1-0) Cr. 3. F.
Introduction to landscape architecture and the conventional drawing practices and methods of delineation.

112, 113. Introduction to Landscape Design.
112. (0-0 or 12) Cr. 2 or 4. W.
Prerequisite: 111 or permission of head of department.

118. (1-0) Cr. 3. S.
Prerequisite: 112.
Introductory problems in landscape design and presentation.

(6-0) Or. 3 each. F.W.
The development of landscape architecture from antiquity to modern times, with its relation to and influences of allied arts and professions. Lectures, readings, abstracts, and reports.

206. Planning Home Landscapes.
(2-0) Cr. 2. F.W.S.
A brief review of the field of landscape architecture with discussions of principles and materials used in the development and maintenance of home grounds. Assigned reading and reports. Not open to students majoring in Landscape Architecture.

208. Rural Landscape Design.
(2-0 or 8) Cr. 2 or 3. F.W.S.
Preparation of plans for farmsteads, small house lots, home and school grounds, and other public areas. Presented for agricultural engineering and horticultural students, as well as those interested in county extension, county home economics and vocational education work.

211, 213, 218. Elements and Theory of Landscape Design. (1-3) Cr. 2 each. Yr.
Prerequisite: 118.
Fundamental theory and principles of design brought out in the solution of simple problems.

(211) (2-2) Cr. 3. W.
Introduction to study of plant materials as used in landscape architecture. Classification, nomenclature, requirements, sources, with winter twig identification.

301, 302, 303. Details of Construction.
(1-6) Cr. 3 each. Yr.
Prerequisite: C.E. 213.
Theory and drafting room problems in landscape construction including grading, drainage and utility plans, estimates of cuts, fills, and cost data.

305. Landscape Service. (1-6) Cr. 3. S.
Planning and maintenance operations and estimating practices, including handling of labor and equipment on landscape operations.
Opportunities for Graduate Study

Courses for Advanced Undergraduate and Graduate Students

514. Collaborative Planning. (2-8) Cr. 8. W. 
Prerequisite: Permission of head of department. Mr. Fitzsimmons
Techniques and procedures involved in modern planning operations. Field trip to nearby cities.

515. Urban Planning Design. (1-6) Cr. 3. S. 
Prerequisite: Permission of head of department. Mr. Fitzsimmons
Techniques and procedures involved in modern urban planning. Group study of an existing community and preparation of comprehensive plans for future development. Field trips, surveys, analyses and reports.

590. Town and Regional Planning Design. Cr. 2 to 6. F.W.S. Mr. Fitzsimmons
Collection of data on specific urban problems, evaluation of data and development of design proposals. Field trips, surveys, analyses and presentation in graphic written form.

Course for Graduate Students

600. Research. Mr. Fitzsimmons.

Opportunities for Undergraduate Study

Courses required of all freshmen are designed to increase facility in the use of books and the use of libraries.

Opportunities for Graduate Study

The library offers facilities for bibliographic research in the scientific and technical
literature of the departments giving graduate instruction. The course "Bibliographic Research" (Library 614) may be taken for either major or minor credit in any department.

Courses Primarily for Undergraduate Students

106. Library Instruction. Required.
Use of books, library, and a survey of literature of major curricula.
A. For students in agriculture. Six weeks. F.

Course for Graduate Students

614. Bibliographic Research.
(1-0) Cr. 1. F.W.S.S.
Prerequisite: College degree. Mr. O. L.
Lectures and practice on location of

printed and manuscript materials and
preparation of bibliographies on technical
and scientific subjects.

MATHEMATICS

JOHN J. L. HINRICHSEN, Ph.D., Head of Department


INSTRUCTORS: Diana L. Hansen, B.S.; Lois A. McCollough, B.S.; Gary H. Meisters, B.S.; Sidney D. Nolte, M.S.; Patricia A. Riggs, B.A.; Constance C. Rosenfeld, B.S.; I. Dale Ruggles, M.A.; Mary Jo Wickliff, B.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in mathematics, leading to the degree of Bachelor of Science, see page 97.

The curriculum in science with a major in mathematics is flexible. It is designed to give the student a thorough foundation in mathematics and to prepare him for (1) work in a computation, research or engineering laboratory, (2) graduate study in mathematics leading toward advanced degrees, or (3) certain required courses in education, teaching at the secondary school level.

Undergraduate majors in this department usually have included the following basic courses in their programs: 101, 102, 103, 211, 212, 213; 21 credits beyond 213, including at least two two-quarter sequences selected from 300-404; 314-315; 430-436; 451-452-453. Differential equations 314, 315 should be included in any case. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in mathematics and in fields of applied mathematics; 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 fifteen quarter credits of work in mathematics beyond calculus. It is desirable that this should include differential equations and theory of equations.

Minor work is usually required in physics, chemistry, engineering, statistics or certain other fields.
Open to graduate students for minor only: 300, 314, 315, 316, 404, 418, 430, 436, 451, 452, 453, 454, 455, 494.

Courses for Noncollegiate Students

5. Advanced Algebra. (5-0) Cr. 5. S.
Prerequisite: One year of high school algebra.
Satisfies requirements for third half-unit of entrance algebra.
Credit in this course does not count toward graduation.

Courses Primarily for Undergraduate Students

100. Mathematics for Students of Agriculture. (5-0) Cr. 5. F.W.S.
Prerequisite: One unit of high school algebra.
Use of slide rule, graphical methods, simple equations, exponents and radicals, logarithms, progressions, interest, numerical trigonometry, applications to agriculture.

101. College Algebra. (5-0) Cr. 5. F.W.S.
Prerequisite: One and one-half units of high school algebra.
Review of high school algebra, systems of equations, logarithms, variations, binomial theorem, progressions, interest, numerical trigonometry, applications to agriculture.

102. Plane Trigonometry. (4 or 5-0) Cr. 4 or 5. F.W.S.
Prerequisite: 101 or 100 and permission of the head of the department.
A. For students in science and landscape architecture. (5-0) Cr. 5.
B. For students in engineering and forestry. (4-0) Cr. 4. Credit or classification in I.E. 105 required for nonengineering students.
Functions of general angles, general identities, graphs, solutions of right and oblique triangles with applications.

103. Analytical Geometry. (5-0) Cr. 5. F.W.S.
Prerequisite: 101, 102.
Engineering students classify in I.E. 106. Co-ordinate systems, graphs, equations of loci, straight lines, conics, special curves, transformations, quadric surfaces, applications.

112. 113. Mathematical Analysis. (5-0) Cr. 5 each. W.S.
Prerequisite: 101 or 100 and permission of instructor.
(112) Functions, graphs, rates, tangents, areas and limiting processes; differentiation and integration of polynomials, logarithmic and exponential functions.
(113) Determinants and applications; fitting line, parabolic, power, exponential and hyperbolic functions to data by methods of graphs, averages, least squares and moments; permutations and combinations; probability of independent, dependent, and mutually exclusive events considering single and repeated trials; distributions; normal probability curve; fiducial probability; test.

200. General Mathematics for Students of Home Economics. (5-0) Cr. 5. S.
Prerequisite: One unit of high school algebra.
Linear, quadratic, exponential, and trigonometric functions; introduction to calculus.

206. Mathematical Theory of Investments. (5-0) Cr. 5. S.
Prerequisite: 101.
Interest, annuities, sinking funds, building and loan associations, bonds, use of tables.
451, 452. Advanced Mathematics in Engineering. (3-0) Or. 8 each. Yr. 
Prerequisite: 314 or 316. 
Selected topics in applied mathematics, including differential equations, hyperboloid functions, Laplace transforms, matrices and determinants, expansion functions. Fourier series, Gamma and Bessel functions, vector analysis, probability, functions of complex variables and dimensional analysis; applications in solution of technical problems.


Courses Primarily for Advanced Undergraduate and Graduate Students:

504, 505. Introduction to Higher Algebra. 
(8-0) Or. 8. F.W. 
Prerequisite: 500, or permission of instructor.

506. Higher Algebra. 
(8-0) Or. 8. W. 
Prerequisite: 504 or 505.

507. Numerical Investigation of Differential Equations. (3-0) Or. 8. F. 
Prerequisite: 514 or 516 or 451.

511. Introduction to Complex Variables and Applications. (8-0) Or. 8. F. 
Prerequisite: 516 or 515.

515, 518. Advanced Calculus. 
(8-0) Or. 8 each. F.W.S. 
Prerequisite: 514. 
Partly differentiation and applications; multiple, line, surface, and solid integrals; indeterminate forms, infinite series and improper integrals. Important integrals which appear in applied mathematics, including elliptic types.

518. Operational Mathematics. 
(8-0) Or. 8. S. 
Prerequisite: 511 or 514. Mr. Maples. 

520. Boundary Value Problems. 
(8-0) Or. 8. W. 
Prerequisite: 514. Mr. Maple. 
Expansion in orthogonal functions, and application to boundary value problems. Verification and uniqueness of solutions. Bessel functions and Legendre polynomials and applications.

534. Introduction to Topology. 
(8-0) Or. 8. W. 
Prerequisite: 504 or 514 or permission of instructor.

536, 537. Analytic Projective Geometry. 
(8-0) Or. 8. S. 
Prerequisite: 218 and permission of instructor.

(Stat. 541, 542, 543) See Statistics.

550. Vector Analysis. 
(Phys. 550) (3-0) Or. 8. S. 
Prerequisite: 514 or 516.


598. Special Topics. F.W.S. 

Courses for Graduate Students:

Prerequisite: Permission of instructor.

601A. Algebraic Geometry. 
601B. Field Theory. 
601C. Group Theory. 
601D. Calculus of Variations. 
601E. Functional Analysis. 
601F. Measure Theory.

601G. Higher Algebra. 
(3-0) Or. 3 each. Alt. W.S. Offered 1959
Prerequisite: 504 or permission of instructor. Mr. Vinograde.

610. Seminar. 

611, 612. Theory of Analytic Functions of One Complex Variable. 
(8-0) Or. 8 each. W.S. 
Prerequisite: 511 or permission of instructor.

614, 615. Functions of Real Variables. 
(3-0) Or. 3 each. W.S. 
Prerequisite: 515 or permission of instructor. Mr. Thielman.

616. Real Continuum. Basic concepts in theory of real functions, theory of point-
617. Probability.
 STAT 616, 617 (3-0) 3 each. Alt.
 W.S. Not offered 1957-58.
 Professor: F. Allen
 Prerequisite: 512 or permission of instructor.
 Fundamental concepts, theory of errors, probability of hypotheses, characteristic functions, geometrical and physical applications. 617. Axiomatic bases, laws of large numbers, extension to infinite dimensions, asymptotic laws, ergodic theory.

621, 622, 623 Differential Equations of Mathematical Physics.
 (3-0) Cr. 3 each. Alt. Yr. Offered 1957-58
 Professor: P. E. Thelen
 Differential equations governing various physical phenomena, existence and uniqueness of solutions, orthogonal functions and expansions, parabolic, elliptic and hyperbolic partial differential equations and their solutions; an introduction to the ideas and techniques of variational methods as applied to problems of the physical sciences.

626. Integral Equations.
 (3-0) Cr. 3 each. Alt. W.S. Not offered 1958
 Professor: J. W. R. S. Dickey
 Linear integral equations, classification, solutions and applications.

632, 633 Differential Geometry and Tensor Analysis.
 (3-0) Cr. 3 each. Alt. W.S. Not offered 1958
 Professor: J. E. L. Dickey
 Application of the calculus to the metric theory of space curves and surfaces; systems of curves, geodesics, ruled surfaces, minimal surfaces and intrinsic properties.

636. Topology.
 (3-0) Cr. 3. Alt. S. Offered 1958
 Professor: J. W. R. S. Dickey
 Topological and metric spaces, introduction to combinatorial topology.


642. Discriminant Theory.
 (Stat. 642) See Statistics.

 (Stat. 643) See Statistics.

645. Econometrics.
 (Ec. 645) See Economics.

646. Time Series.
 (Ec. 646, Stat. 646) See Statistics.

647. Multivariate Analysis.
 (Stat. 647) See Statistics.

649. Recent Developments in Statistics and Probability.

651, 652, 653 Mathematical Theory of Fluid Dynamics.

654, 655, 656 Dynamics.
 (Phys. 654, 655) (3-0) Cr. 3 each. W.S.
 Professor: F. Allen
 Professor: F. Allen
 Professor: F. Allen
 Vector methods in dynamics; free and forced vibration systems; normal co-ordinates; Lagrange and canonical equations; contact transformations; Hamilton-Jacobi equations; orbital theory and celestial mechanics; integration theories of dynamics.

 (3-0) Cr. 3 each. Alt. Yr. Not offered 1957-58
 Professor: F. Allen
 Professor: F. Allen
 Professor: F. Allen
 Equations of motion of particles; existence and uniqueness theorems; linear systems with real and complex coefficients; Sturm-Liouville systems; eigen-functions; non-linear systems; stability theorems.

661, 662, 663 Mathematics of Elasticity.
 (T.A.A.M. 661, 662, 663) (3-0) Cr. 3 each. Alt. Yr. Not offered 1957-58
 Professor: F. Allen
 Professor: F. Allen
 Professor: F. Allen
 Mathematics of elasticity; normal co-ordinates; Lagrange and canonical equations; orbital theory and celestial mechanics; integration theories of dynamics.

666, 667, 668 Static and Dynamic Problems of Plates and Shells.
 (T.A.A.M. 666, 667, 668) (8-0) Cr. 3 each. Alt. Yr. Offered 1957-58
 Professor: F. Allen
 Professor: F. Allen
 Professor: F. Allen
 Two-dimensional problems of plane stress, plane strain; torsion and flexure; general stress-strain analysis in three dimensions; variational methods.

671, 672 Mathematical Theory of Plasticity.
 (3-0) Cr. 3. Alt. W.S. Offered 1958
 Professor: F. Allen
 Professor: F. Allen
 Professor: F. Allen
 Thin plate analysis; three-dimensional plate problems; shells; stability and vibration of plates and shells.

681, 682, 683 Quantum Mechanics.
 (Phy. 681, 682, 683) See Physics.


699. Research.

MECHANICAL ENGINEERING

HENRY M. BLACK, S.M., Head of Department

PROFESSORS: Mark P. Cleghorn, M.E.; Lambert S. Linderoth, Jr., M.E.; John F. Sandfort, M.S.; Herman J. Stoever, Ph.D.

ASSOCIATE PROFESSORS: Robert W. Breckenridge, M.S.; Robert C. Fellinger, M.S.; Eugene S. Ferguson, M.S.; Ralph L. Freeman, M.S.; Marvin E. Gould, B.S.

ASSISTANT PROFESSORS: Harold R. Buhl, M.S.; John Hug, M.E.; George K. Serovy, M.S.

INSTRUCTORS: Carl Gesser; John M. Green, B.S.; George Junkhan, B.S.; Jerry D. Marshall, B.S.
Opportunities for Undergraduate Study

For undergraduate curriculum in mechanical engineering leading to the degree of Bachelor of Science, see page 76.

The professional services performed by mechanical engineers vary from the highly scientific work of research and development through the applied work of design and production, to the management, operation, and sales activities of industry. These services are rendered in fields ranging from the conversion and utilization of heat, to the development and design of machines, and the manufacture of commodities.

The curriculum includes, in addition to the fundamental sciences of mathematics, chemistry, and physics, a well-balanced series of courses in metallurgy, machine design, fundamental thermodynamics and heat, and applied thermodynamics. Opportunity is offered for limited specialization in mechanics and design; in steam power equipment; internal combustion engines; heating, ventilation, and air conditioning; electronics applications; industrial and manufacturing; mathematics or physics.

By arrangement with selected industrial organizations in Iowa and nearby states, a cooperative work-study program in Mechanical Engineering is available. This program requires a total of five years for completion of the standard four-year curriculum. Further information may be obtained by writing to the department of Mechanical Engineering.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in mechanical engineering; and minor work to students taking major work in other departments. Work may be taken for the degree of Doctor of Philosophy as a divided major with departments offering work in related fields for this degree.

Students desiring to major in this department should have completed an undergraduate curriculum equivalent to that required of undergraduate students in mechanical engineering at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students for minor only: 312, 315, 321, 322, 325, 342, 423, 426, 427, 429, 435, 440, 444, 445, 448.

Courses Primarily for Undergraduate Students

100. Technical Lecture. (1.0) Required. S. Field of mechanical engineering, its opportunities and requirements.

201. Manufacturing Processes. (3.0) Cr. 3. F.W.S. Principles and practice of machine tool and bench working of metals. Machining of steel, cast iron, and non-ferrous metals.

202. Metal Casting. (3.0) Cr. 2. F.W.S. Processes and equipment employed in molding and casting of ferrous and non-ferrous metals.

204. Metal Fabrication. (3.0) Cr. 2. F.W.S. Gas and electric welding. Study of pipe, pipe joints and fittings. Sheet metal construction.

205. Metal Fabrication. (3.0) Cr. 2. F.W.S. Principles and equipment utilized in the manufacture of metal products. Demonstration of tools and processes.

207. Machine Shop. (0.6) Or. 2. S. For Industrial Education Majors. Milling machine, shaper, grinder, drill press, bench work.

211. Physical Metallurgy. (3.0) Cr. 3. F.W. Prerequisite: Chem. 103. Basic principles of physical metallurgy, structure and solidification of metals, alloy systems, phase transformations, non-ferrous and ferrous alloys, deformation, testing, electrical and magnetic properties of metals, corrosion.


231. Engineering Metallurgy. (4.3) Cr. 5. F.W. Prerequisite: Credit in Chem. 103. Fundamental principles of chemical, physical, and mechanical metallurgy; structure and solidification, mechanical properties, phase transformations, production of metals, heat treatment, deformation, corrosion, physical properties.

233. Metal Processing. (3.4) Cr. 3. W.S. Prerequisite: Credit in M.E. 231. Application of principles of metallurgy to the fields of casting, mechanical working, welding, and powder metallurgy.

305. Tool Engineering. (1.0) Cr. 3. S. Prerequisite: 205. Design and application of special tools, jigs, and fixtures.

310. Kinematics. (3.0) Cr. 3. F.W.S. Prerequisite: Credit or classification in T.A.M. 274. Analysis of displacements, velocities, and accelerations in machines. Study of links, gears, belts, and miscellaneous mechanisms.


315. Design of Machine Elements. (4.3) Or. 5. F.S. Prerequisite: 312, T.A.M. 324. Design of fastenings, pressure vessels, shafts, gearing, belting, clutches; bearings and lubrication.
### Courses for Advanced Undergraduate and Graduate Students

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>321, 322</td>
<td>Thermodynamics (4-0)</td>
<td></td>
<td>Cr. 4 each, F.W.S.</td>
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<tr>
<td>321</td>
<td>Prerequisite: Phys. 222, T.&amp;A.M. 274</td>
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<tr>
<td>322</td>
<td>Prerequisite: 321, classification in expt. 342</td>
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<tr>
<td>325</td>
<td>Heat Transfer. (4-0)</td>
<td>3. F.S.</td>
<td></td>
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<tr>
<td>321 or 344</td>
<td>Prerequisite: Math. 314.</td>
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<tr>
<td>342</td>
<td>Thermodynamics Laboratory. (0-8) Cr. 1. W.S.</td>
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<tr>
<td>343</td>
<td>Mechanical Laboratory. (0-3) Cr. 1. F.S.</td>
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<tr>
<td>344</td>
<td>Thermodynamics. (4-3) Cr. 5. F.W.S.</td>
<td></td>
<td>Prerequisite: Math. 213, Phys. 222</td>
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<tr>
<td>400</td>
<td>Inspection Trip. Required F.</td>
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<tr>
<td>406</td>
<td>Electric Generation and Air Conditioning. (4-0) Cr. W.</td>
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<td>Prerequisite: Arch 306.</td>
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<tr>
<td>407</td>
<td>Mechanical Equipment Design. (2-6) Cr. 4. S.</td>
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<tr>
<td>408</td>
<td>Mechanical Equipment of Buildings. (2-6) Cr. 4. F.</td>
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<tr>
<td>423</td>
<td>Machine Design. (1-6) Cr. 3. F.W.</td>
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<tr>
<td>426</td>
<td>Refrigeration and Air Conditioning. (3-3) Cr. 4. W.F.S.</td>
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<tr>
<td>427</td>
<td>Heating and Air Conditioning Design. (2-0) Cr. 4. W.S.</td>
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<tr>
<td>429</td>
<td>Internal Combustion Engine Design. (2-6) Cr. 4. W.S.</td>
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<tr>
<td>435</td>
<td>Mechanical Behavior of Metals. (4-0) Cr. 4. F.S.</td>
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<tr>
<td>440</td>
<td>Fuels and Combustion. (3-3) Cr. 4. F.S.</td>
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<tr>
<td>445</td>
<td>Steam Power Equipment. (3-3) Cr. 4. F.W.S.</td>
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<tr>
<td>447</td>
<td>Special Problems. Cr. 3 to 5. F.W.S.</td>
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<tr>
<td>501</td>
<td>Engineering Measurement. (8-0) Cr. 3 or 4. F.</td>
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<tr>
<td>513</td>
<td>Lubrication. (4-0) Cr. 4. S.</td>
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<tr>
<td>515</td>
<td>Advanced Design of Machine Elements. (4-0) Cr. 4. W.</td>
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<tr>
<td>531</td>
<td>Metallurgy of Metal Casting and Forming. (8-0) Cr. 3. F.</td>
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<tr>
<td>532</td>
<td>Advanced Heat Treatment and Selection of Steels. (4-0) Cr. 4.</td>
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<tr>
<td>533</td>
<td>Metallurgy of Welding. (2-0) Cr. 2. Alt. S.</td>
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<tr>
<td>534</td>
<td>Principles of Turbomachinery. (4-0) Cr. 4. S.</td>
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<tr>
<td>535</td>
<td>Special Topics. Cr. 3 to 5. F.W.S.</td>
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</table>

### Course Descriptions

- **321, 322. Thermodynamics.**
- **325. Heat Transfer.**
- **342. Thermodynamics Laboratory.**
- **400. Inspection Trip.**
- **406. Electric Generation and Air Conditioning.**
- **407. Mechanical Equipment Design.**
- **408. Mechanical Equipment of Buildings.**
- **423. Machine Design.**
- **426. Refrigeration and Air Conditioning.**
- **427. Heating and Air Conditioning Design.**
- **429. Internal Combustion Engine Design.**
- **435. Mechanical Behavior of Metals.**
- **440. Fuels and Combustion.**
- **445. Steam Power Equipment.**
- **447. Special Problems.**
- **501. Engineering Measurement.**
- **513. Lubrication.**
- **515. Advanced Design of Machine Elements.**
- **531. Metallurgy of Metal Casting and Forming.**
- **532. Advanced Heat Treatment and Selection of Steels.**
- **533. Metallurgy of Welding.**
- **534. Principles of Turbomachinery.**
- **535. Special Topics.**

*Course descriptions and prerequisites are subject to change. Please consult the current academic catalog for the most accurate information.*
Courses for Graduate Students

600. Advanced Machine Design. Or. 3 to 5. S. Mathematical and experimental analysis of problems in field of dynamics of machinery, stress analysis, and vibration. Choice of work any quarter determined by aptitudes and interests of class.

610. Dynamics of Automatic Control System. Or. 3 or 5. S. Dynamical characteristics of the elements for measurements and automatic control of variables in mechanical, thermal and fluid systems and devices.

620. Seminar. (1-0) Or. 1. Messrs. Black, Stoever

640. Industrial Heating and Air Conditioning. Or. 3 to 5. F. Mr. Black Theory and practice of plant and industrial heating, ventilation, and air conditioning.

645. Advanced Engineering Thermodynamics. Or. 4 to 8. W.S. Mr. Stoever. Fundamental concepts of thermodynamics, thermodynamic laws, temperature, entropy, thermodynamic equations, properties of steam, fluid flow, mixtures, combustion, special topics.


655 Research. Messrs. Black, Olshorn, Stoever

METALLURGY

Administrative Committee: H. A. Wilhelm, Acting Chairman

H. M. Black, G. W. Fox, M. Smutz, C. A. Goetz, Secretary

Interested students are advised to communicate with the Secretary.

Opportunities for Undergraduate Study

A special curriculum in metallurgy is not offered for the baccalaureate degree. The undergraduate student is encouraged to elect the specialized courses in metallurgy as a supplement to his basic training in engineering or science.

Opportunities for Graduate Study

Graduate study in metallurgy is organized on an interdepartmental basis under the direction of the Administrative Committee. The departments of chemical engineering, chemistry, mechanical engineering and physics are cooperating in this program. The Committee has the responsibility of administering the details of the program, and of making all recommendations usually made by a head of a department. A student majoring in metallurgy will choose a major professor from the graduate faculty membership of the cooperating departments, and will develop his program of study under the guidance of a committee nominated by the Administrative Committee, and appointed by the Dean of the Graduate College.

Major work is offered for the degrees of Master of Science and Doctor of Philosophy in metallurgy, and minor work is offered to students taking major work in authorized departments. Prerequisite to graduate study in the field of metallurgy is satisfactory completion of a suitable undergraduate curriculum such as chemical engineering, chemistry, mechanical engineering, metallurgical engineering, metallurgy, mining engineering or physics.

Excellent facilities for investigations in theoretical and applied fields of metallurgy are provided by the cooperating departments and the Institute for Atomic Research.

The following courses bearing on advanced study in metallurgy are available in the offerings of the departments named:

Ceramic Engineering, 611.


Physics, 592, 611, 612, 613, 622, 623, 626, 690.

Theoretical and Applied Mechanics, 500, 514, 517, 518, 568, 594, 595, 600.

* Recommended for a minor in metallurgy
**Basic courses for metallurgy major.
Since the establishment of our national government, reliance has been placed upon citizen armies for defense, rather than upon a large standing army of professional soldiers. It is part of the American tradition that citizenship carries with it certain obligations as well as privileges. In conformity with this tradition, the National Defense Act of 1920 provided for only a small Regular Army and National Guard, and set up a skeleton organization upon which a citizen army could be built in time of need. One of the most important elements in this framework consists of corps of reserve officers trained in our colleges and universities. The Reserve Officers Training Corps provides the organization for training these future officers.

Training in Military Science and Tactics has been conducted at Iowa State College since the college was established.

As a result of operation of the Reserve Officers Training Corps, the United States had immediately available at the outset of World War II over one hundred thousand reserve officers who required only a short period of training to prepare them for active duty. These officers were of vital importance to the nation in the mobilization and training of our vast citizen army, as well as its leaders in combat.

The United States Army ROTC Program is designed to prepare college students for positions of leadership in the Army in time of National emergency. Principles of leadership, and the military responsibilities of the citizen in a free democracy are emphasized. This instruction is divided into the basic course and the advanced course.

The basic course is conducted during the student's first two years of college and is devoted to basic military subjects which are common to all branches of the United States Army. Uniforms are furnished by the United States Army for basic ROTC cadets. A deposit is required when the uniform is issued to the student. This deposit is refunded when the uniform is returned in good condition.

The advanced course is conducted for students who have completed the basic course and are taking third and fourth year work in college. The advanced course is offered to qualified students who volunteer and who are selected for the course. This course is designed to prepare students for positions as commissioned officers in the United States Army, either in the United States Army Reserve or in the Regular United States Army. Instruction is offered in Artillery, Corps of Engineers, and Signal Corps.

Cadets attend a six week summer camp during the first part of the summer after their first year of the advanced course. At this summer camp they apply the theory they have learned in the classroom to solve practical exercises.

Advanced course students receive officer type uniforms made to individual measurements. These are provided for by a monetary allowance paid to the college by the United States Army. A uniform deposit is required of each student upon his entry into the advanced course. This deposit is refunded upon completion of the course.

An allowance, approximately 90¢ per day, is paid to each advanced corps cadet. The cadet is paid while at summer camp as well as being paid for travel to, and return from, summer camp.

Upon satisfactory completion of the advanced ROTC course, graduation from college and approval of the professor of Military Science, the student is commissioned in the
United States Army, either in the United States Army Reserve or the Regular United States Army.

Basic Course, Senior Division ROTC

111, 112, 113. Military Science I.
(1-2) Cr. 1 each.
Leadership; American military history; individual weapons and marksmanship; citizenship; school of the soldier.

211, 212, 213. Military Science II.
(1-2) Cr. 1 each.

Prerequisites: Military Science I or approval of professor of Military Science. Leadership; school of the soldier; map and aerial photograph reading; crew-served weapons and gunnery; military communications; basic military tactics; school of the soldier.

Advanced Course Senior Division ROTC

Courses in Artillery Unit

321, 322, 323. Military Science III.
(0-6) Cr. 3 each.
Prerequisites: Military Science I and II and approval of professor of Military Science. Leadership; citizenship; military teaching methods; artillery organization; artillery gunnery; artillery survey and communications; operation of artillery battery.

Courses in Engineer Unit

401, 402, 403. Military Science IV.
(0-6) Cr. 3 each.
Prerequisites: Military Science III. Leadership; citizen of United States or ROTC student; military administration; military justice; service orientation; engineering logistics and operations; combat and staff procedures; new developments.

Courses in Signal Corps Unit

431, 432, 433. Military Science IV.
(0-6) Cr. 3 each.
Prerequisites: Military Science III. Leadership; citizen of United States or ROTC student; military administration; military justice; service orientation; engineering logistics and operations; communications center procedures; new developments.

MODERN LANGUAGES

ALFRED P. KEHLENBECK, Ph.D., Head of Department

Professor: Louis DeVries, Ph.D.

Associate Professors: Gladstone R. Fluegge, Ph.D.; Cecil D. McVicker, Ph.D.; Frederick Schwartz, Ph.D.

Assistant Professor: Dan M. Anderson, Ph.D.

Instructors: Charlotte H. Bruner, M.A.; Martha T. Halsey, M.A.; Boris Michelsons; Tereze Michelsons.

Opportunities for Undergraduate Study

The instruction offered in the Department of Modern Languages is designed to give the student the basic fundamentals in the languages offered and to introduce the students to the culture of the people whose language is being studied.

Elementary courses at the 200 level are for undergraduates who have had no previous instruction in the language chosen at the college level. The 300 series is for those who have had a full year of college instruction or two years of high school work in the language concerned. The 400 series is for those who wish advanced or special training. They make it possible to take four years' work in French, German and Spanish.
The student in science will find it best to satisfy his language requirement by taking all of his work in one language.

Students who are preparing to teach in the public school system may find a minor in modern languages useful.

201A, 202A, 231A, 232A, 233A are reading knowledge courses open to graduate students and qualified undergraduates whose major departments feel that a reading knowledge of two languages might be preferable to a more detailed knowledge of one language.

CoursesPrimarily for Undergraduate Students

201, 202, 203. Elementary French. 
(3-0) Cr. 3 each. F.W.S.
201. Prerequisite: No previous college credit in French.
202. Prerequisite: 201 or equivalent.
203. Prerequisite: 202 or equivalent.

201A. Reading Knowledge of French. 
(3-0) Cr. 3 each or required. F.W.S.
Prerequisite: No previous college credit in French.

221A. Reading Knowledge of Russian. 
(3-0) Cr. 3 each or required. F.W.S.
Prerequisite: No previous college credit in Russian.

231A. Reading Knowledge of German. 
(3-0) Cr. 3 each or required. F.W.S.
Prerequisite: No previous college credit in German.

233A. Reading Knowledge of Spanish. 
(3-0) Cr. 3 each or required. F.W.S.
Prerequisite: No previous college credit in Spanish.

(3-0) Cr. 3 each or required. F.W.S.

(3-0) Cr. 3 each. F.W.S.
301. Prerequisite: 205 or equivalent.
302. Prerequisite: 205 or equivalent.

(3-0) Cr. 3 each. F.W.S.

331, 332, 333. Scientific German. 
(3-0) Cr. 3 each. F.W.S.

341, 342. Modern German Prose. 
(3-0) Cr. 3 each. F.W.S.

(3-0) Cr. 3 each. F.W.S.

491. Advanced German. 
Cr. 1 to 3 each time elected. F.W.S.
Prerequisite: 15 college credits in German or the equivalent.

492. Advanced French. 
Cr. 1 to 3 each time elected. F.W.S.
Prerequisite: 15 college credits in French or the equivalent.

493. Advanced Spanish. 
Cr. 1 to 3 each time elected. F.W.S.
Prerequisite: 15 college credits in Spanish or the equivalent.

MUSIC

ALVIN R. EDGAR, M.A., D.Mu., Head of Department

PROFESSOR: Tolbert MacRae.
ASSOCIATE PROFESSORS: Iiza L. Niemack; Ira Schroeder, B.Mu.
INSTRUCTORS: Roma J. Buchenau, M.M.; Phyllis Dale Carroll, M.M.

Opportunities for Undergraduate Study

The Department of Music seeks to furnish students with an interest in music a means of developing their musical ability. An opportunity is offered to gain a cultural advantage by active participation in the various ensemble organizations which are under the direction of the members of the music faculty and through private lessons in all branches of musical endeavor.
The following musical organizations are maintained by the College: Iowa State Singers, Men's Glee Club, Festival Chorus, Symphony Orchestra, and Concert Band. All of these groups give concerts during the year, and the Concert Band, Singers and Symphony Orchestra go on concert tours.

**Courses Primarily for Undergraduate Students**

**Iowa State College Festival Chorus. Yr.** Members of student body and faculty are eligible. Interpretation of choral work, secular and sacred.

**111, 112, 113.† Band. (2-0) Cr. 1 each Yr.** Open to all students who qualify. Concerts and annual tour in addition to playing for convocations and athletic events.

**141, 142, 143. Glee Clubs. Cr. 1 each Yr.** Glee clubs are open to all students by application to the director. Rehearsals twice weekly, plus Festival Chorus.

**144.† Music Appreciation.** (2-0) Cr. 1. F.W.S. Designed to acquaint students with form and meaning of good music. Lectures demonstrated by musical selections.

**151, 152, 153.† Orchestra.** (2-0) Cr. 1 each Yr. Open to all students who qualify. Concerts presented each quarter; annual tour fall quarter.

**161, 162, 163.† Iowa State Singers.** (2-0) Cr. 1 each Yr. Open to all students who qualify.

**312, 312, 313.† Private Music Lessons.** (1-0) Cr. 1 each Yr. Private instruction in any branch of music, including harmony. See page 19. for fee.

**A. Voice.**

**B. Piano.**

**C. Organ.**

**D. String Instruments.**

**E. Band Instruments.**

**F. Harmony.**

**344. Music in Radio and Television Production.** (1-2) Cr. 2. S. Prerequisite: 144. Music vocabulary and pronunciation; recorded music; library of recorded music; copyright information; musical history and forms; sources of music for various moods.

**361.† Conducting.** (2-0) Cr. 1. W. Prerequisite: Permission of the head of the department. Preparation for conducting band, orchestra, or choral club. Major emphasis on technique of conducting. Demonstration and laboratory.

†A total of not more than 8 credits will be allowed toward graduation.

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**NAVAL SCIENCE**

CAPT. WILLIAM M. DRANE, USN, B.S., Head of Department

**ASSOCIATE PROFESSORS:** Cdr. James F. Hill, USN, B.A.; Maj. John H. Johnstone, USMC, M.S.

**ASSISTANT PROFESSORS:** Lt. Charles R. Irby, USN, B.S.; Lt. JG. Harry H. Phillips, USN, A.B.; Lt. JG. Wayne A. Muth, USN, B.S.

**INSTRUCTORS:** John D. Berlin, FTC; Bernard J. Malarkey, Jr., QM1; Robert L. Wilmes, GM1; Leo J. Spenla, T/Sgt., USMC.

The first Naval Reserve Officers Training Corps units were established in 1926. There are now 52 units in various colleges and universities throughout the United States. Iowa State College is the only college in the state of Iowa which has an NROTC unit.

The function of the Naval Reserve Officers Training Corps is to provide, by a permanent system of training and instruction in essential naval subjects at civil educational institutions, a source from which qualified officers may be available for the Navy and the Marine Corps, and the Naval Reserve and the Marine Corps Reserve.

There are two types of NROTC enrollees, the Regular and the Contract. The programs are similar in that all students pursue studies of their choice leading to a baccalaureate degree and in addition take one naval science course each quarter; however, limited quotas are established by the Department of the Navy for both programs. Candidates for the Regular program are selected in the spring preceding the freshman year after having passed a nation-wide aptitude test and physical examination. Contract students normally apply after graduation from high school and are selected during Freshman Days.

In addition to completing the prescribed naval science course each midshipman enrolled in the NROTC must fulfill the following additional course requirements:

a. By the end of the sophomore year, every regular NROTC student must have satisfactorily completed one year of college physics.

b. By the end of the sophomore year, every student must have satisfactorily completed mathematics courses through trigonometry. Credit will be given for mathematics taken in secondary school.
c. Every student must achieve proficiency in written and oral expression in accordance with the standards prescribed by the College.

It is desirable that every student complete the following:

a. A sequence in mathematics, extending through calculus, and including spherical trigonometry.

b. A second year of physical science, such as advanced electricity and elementary electronics, for other than engineering students.

c. A one-year sequence in personnel management and administration.

d. A one-year course in world politics and international organization.

e. Two years of foreign language or demonstrate by examination that he possesses a good reading knowledge and can make an acceptable written translation of one of the languages.

f. A course in public speaking.

NROTC students are not required to major in naval science. They may select any curriculum or major in the College with the exception of veterinary medicine. Students may not be enrolled in courses preparatory to the study of dentistry, medicine, theology, or pharmacy. Recommended fields of study are engineering, mathematics, physical or social sciences, and industrial economics.

The regular student is provided the following by the government: uniforms, textbooks, college tuition and fees, and $600 a year in pay. The academic work of the school year is supplemented by two summer cruises and one summer of aviation- amphibious training. Upon receipt of his bachelor's degree, the student is commissioned in the Navy or in the Marine Corps. He is then required to serve on active duty for four years, at the end of which time he may choose the service for a career or go to inactive duty in the Reserve.

The contract student takes only one summer cruise of three to eight weeks' duration. He receives uniforms and is paid, during his junior and senior years, about $27 a month. He must agree to accept a commission in the Naval or Marine Corps Reserve if offered, and to serve on active duty after graduation for a period of two years if called.

The general objectives of the program are:

1. To provide the student with a well-rounded course in basic subjects which, in conjunction with a baccalaureate degree, will qualify him for a commission in the United States Naval Service.

2. To develop a knowledge of, and an interest in, naval customs and traditions.

3. To develop a capacity for leadership.

Opportunities for Undergraduate Study

Required and supporting courses for the major in naval science in the curriculum in Science: Completion of Naval Science 311, 312, 313, 311M, 312M, 313M, and choice of 411, 412, 413 or 411M, 412M, 413M, with minors in mathematics and choice of physics, electrical engineering, mechanical engineering or industrial engineering. The following courses should be included in group requirements or electives: Phys. 211, 212, 213 or 221, 222, 223, and 445, 446 (unless electrical engineering is minor); Zool. 104, 105 and 203; Ec. 241, 242; Psych. 104 and 464; Hist. 331, 332, 333; I.E. 351, 425.

Courses Primarily for Undergraduate Students

111, 112, 113. Evolution of Sea Power and Naval Orientation. (8-2) Or. 3 each. Yr.

111. Sea power from conception in early Mediterranean and Roman periods through World War I.

112. Sea power from World War I to present; naval customs and organization.

113. Orientation. Functions and employment of naval components, seamanship and tactics.

211, 212, 213. Naval Weapons. (3-2) Or. 3 each. Yr.

211. Capabilities and limitations of all types of modern naval weapons; explosives.

212. Fire control. Basic principles of the employment and control of naval surface and anti-aircraft weapons.

213. Fundamentals of operation and employment of radar and sonar; and guided missiles; anti-submarine warfare and combat information center.

811, 812, 813. Naval Engineering and Navigation. (3-3) Or. 3 each. Yr.

811. Theory and construction of typical modern naval engineering installations; properties of steam.


313. Navigation instruments and equipment, piloting, radar, loran and
nautical astronomy. Celestial navigation and navigator’s day’s work.

311M. History of the Art of War. (3-2) Cr. 3. F.
The art of war as developed through the ages. Marine Corps students will begin their specialty fall quarter of their third year.

312M. United States Military History and Policy: Basic Tactics. (3-2) Cr. 3. W.
Origin and development of United States armed services. Introduction to basic modern tactics.

313M. Basic Strategy and Tactics. (3-2) Cr. 3. S.
Basic tactical principles for squad and platoon. Study of historical examples of amphibious operations.

411. 412. 413. Naval Operations and Naval Administration. (3-2) Cr. 3 each. Yr.
411. Naval operations. Course and speed problems, rules of the road, maneuvering instructions and meteorology.

412. Fleet operations and fleet communications. Introduction to naval administration, shipboard organization and training.

418. Uniform code of military justice, leadership, discipline, morale and human relations.

411M. Amphibious Warfare. (3-2) Cr. 3. F.
Basic principles and organization for amphibious war.

412M. Amphibious Warfare. (3-2) Cr. 3. W.
Advanced principles and organization for amphibious war; analysis of selected amphibious operations.

414M. Leadership and the Uniform Code of Military Justice. (3-2) Cr. 3. S.
Uniform code of military justice; administration, psychology and technique; duties and responsibilities of officers. (Marine viewpoint)

NUCLEAR ENGINEERING

Administrative Committee: GLENN MURPHY, Ph.D., Chairman


Courses in Nuclear Engineering are offered and administered by the Department of Engineering. (See page 164.)

Opportunities for Undergraduate Study

A curriculum in nuclear engineering is not offered for the baccalaureate degree. The undergraduate interested in nuclear engineering is encouraged to complete a curriculum in one of the available fields in engineering in preparation for graduate studies. A survey course in nuclear engineering, 474, is available at the undergraduate level.

Opportunities for Graduate Study

Major work is offered for the degrees Master of Science and Doctor of Philosophy in nuclear engineering, and minor work is offered to students taking major work in other departments.

Prerequisite to major work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution. When possible, it is recommended that students include courses in chemistry beyond freshman chemistry, modern physics, heat transfer and mathematics beyond differential equations as part of their undergraduate preparation.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the chairman of the Nuclear Engineering Administrative Committee.

No undergraduate courses are available to graduate students for minor credit.

Courses Primarily for Undergraduate Students

474. Introduction to Nuclear Engineering. (3-0) Cr. 3. S.
Prerequisite: M.E. 344 and Math. 314 or permission of instructor.

Courses for Advanced Undergraduate and Graduate Students

500. Special Topics. (2 to 5-0) Cr. 2 to 5. F.W.S.

501. Elements of Nuclear Engineering. (3-0) Cr. 3. F.
Prerequisite: M.E. 344, T.&A.M. 324; Credit or classification in Phys. 465. Mr. Murphy.


502. Reactor Materials and Structures. (3-0) Cr. 3. W.
Prerequisite: 501, M.E. 325. Mr. Murphy.
Mechanical and nuclear properties of solid and fluid reactor materials. Thermal and structural problems in reactors.
504. Elements of Nuclear Reactor Design. (1-8) Cr. 3. S. 
Prerequisite: Phys. 536. Mr. Murphy
Engineering aspects of reactor design and use of nuclear power.

510. Nuclear Radiation Measurements. (1-4) Cr. 3. F. 
Prerequisite: Phys. 435. Mr. Murphy
Principles of nuclear radiation detection and measurement. Ionization chambers, proportional counters, gas tubes, counting circuits. Applications to engineering problems.

Courses for Graduate Students

600. Research. Messrs. Murphy, Smith, Smutz. Town

602. Radiation Shielding. (3-0) Cr. 4. 
Prerequisite: 504, Phys. 536, Chem. 408. Mr. Murphy
Design of shielding systems for protection against gamma rays and neutrons. Applications to nuclear reactors, cooling systems, processing equipment and other engineering units.

620. Seminar. (1-0) Cr. 1. F. 
Prerequisite: Permission of instructor. Mr. Murphy
Current literature in nuclear engineering.

NUCLEAR SCIENCE

Advisory Committee: Don S. Martin, Jr., Ph.D., Chairman


Courses in nuclear physics, neutron diffusion theory, health physics, radio-chemistry, tracer techniques, nuclear fuels and wastes, nuclear reactor design and other engineering applications are given in the appropriate departments. All of the offerings are based on unclassified information and are available to any student having the required prerequisites.

To assist in formulating a well-rounded program in this area for individual students, the field of nuclear science has been established as a minor for the degrees of Master of Science and Doctor of Philosophy. This minor is available to students majoring in any department, but the recommendation of courses for the minor is under the jurisdiction of the Advisory Committee. In each instance, the minor is planned in harmony with the over-all program of the individual student.

For those students wishing to concentrate their study in the field of nuclear science and its engineering applications, a program leading to the degree of Master of Science and Doctor of Philosophy with a major in nuclear engineering is available.

PHYSICAL EDUCATION FOR MEN

Louis E. Menze, B.S., Head of Department

Professor: Harry J. Schmidt, M.A.


Instructors: Douglas W. Bradley; Russell Faulkinberry, B.A.; Rudolph A. Feldman, B.S.; Richard C. Heatly, B.A.; Arch Steel, M.A.

Opportunities for Undergraduate Study

For undergraduate curriculum in physical education, administered under the Division of Science, leading to the degree of Bachelor of Science, see page 97.

The curriculum in physical education, prepares the student to teach a science and physical education, to coach athletics or to direct recreational programs for schools, camps, industries or communities. Professional students in physical education for men usually
choose minors from the fields of general science, agriculture, industrial education, mathematics, and social sciences as teaching areas, or from technical journalism and radio. Each student's program is designed to fit his particular needs and interests. Specific inquiries should be directed to the head of the department.

The work of the department includes, in addition, required courses for freshmen and sophomores, and competitive programs in intramural and intercollegiate athletics.

In the required program, it is the aim of the department to promote the health, organic vigor and good physical habits of the students. To accomplish this, a program is offered the student which will afford him the opportunity to participate in and to develop a reasonable degree of skill in a variety of leisure time activities for immediate and later recreational appreciation and enjoyment.

Through the intramural program, every man is given an opportunity to participate in competitive sports. The intramural program includes football, touch football, softball, basketball, volleyball, wrestling, tennis, indoor and outdoor track, handball, horseshoe pitching, baseball, golf, archery, fencing, hockey, table tennis, and swimming. The facilities of the department include an eighteen hole golf course, tennis courts, an ice skating area, playfields, gymnasium and swimming pool.

Intercollegiate athletics are under the direction of the faculty. Iowa State College is a member of the Missouri Valley Intercollegiate Athletic Association and is subject to the rules of this conference. The college is also a member of the National Collegiate Athletic Association and is committed to tolerate only clean and wholesome sport and to promote good sportsmanship among contestants and spectators. The college is represented by intercollegiate teams in football, cross country, basketball, wrestling, swimming, indoor track and outdoor track, baseball, tennis and golf.

**Required Program Courses**

**Requirement:**
All male students are required to take two hours of physical education each week for the first six quarters of student residence.

**Exemptions:** The following students are exempt from this requirement:
1. Those certified as physically unfit by the Student Health Service.
2. Those classified as veterans of the armed forces as follows:
   a. Six months—exempted from second year.
   b. Two years—exempted from entire requirement.
3. Those who, at the time of matriculation, have passed their twenty-third birthday.
4. Other exemptions at the discretion of the department head, such as proven proficiency in sports as demonstrated by examination in:

**Courses passed by these examinations are credited as replacement of the sixth, fifth, etc. quarters of the requirement.**

**Courses Primarily for Undergraduate Students**

101. **Freshman Physical Education.** (0-2) Required. F.
Classification and orientation in Physical Education Activities.

102. **Sports Appreciation.** (0-2) Required. W.
Orientation in recreational sports.

**Aquatics**

111. **Beginning Swimming.** (0-2) Required. S.
112. **Intermediate Swimming.** (0-2) Required. W.
113. **Advanced Swimming.** (0-2) Required. S.

**Team Sports**

121. **Baseball.** Cr. R., Exam. Only
122. **Basketball.** (0-2) Cr. R., W. and Exam.
123. **Football.** Cr. R. Exam only.
124. **Volleyball and Touch Football.** (0-2) Cr. R. F.

110. **Adapted Sports.** (0-2) Required. Yr.
For students with physical limitations. Upon consultation and with the recommendation of the Student Health Service, each student will be re-enrolled in an activity falling within his physical capacity.

114. **Life Saving.** (0-2) Required. F.
115. **Water Safety.** (0-2) Required. S.
This group of courses is graduated to accommodate teaching the student the skills of swimming on the basis of his individual ability classification.

125. **Volleyball and Softball.** (0-2) Cr. R. S.
Techniques and practice. Those so indicated are by proficiency examination only.
Combatives
133. Beginning Fencing. (0-2) Cr. R. W.
134. Advanced Fencing. (0-2) Cr. R. W.
135. Beginning Wrestling. (0-2) Cr. R. F.W.

Individual Recreational Sports
141. Beginning Archery. (0-2) Cr. R. F.S.
142. Advanced Archery. (0-2) Cr. R. F.S.
143. Archery Crafts. (0-2) Cr. R. W.
144. Beginning Batcasting. (0-2) Cr. R. F.S.
145. Advanced Batcasting. (0-2) Cr. R. F.S.
146. Batcasting Crafts. (0-2) Cr. R. W.
147. Beginning Bowling. (0-2) Cr. R. F.W.S.
148. Advanced Bowling. (0-2) Cr. R. F.W.S.
149. Beginning Golf. (0-2) Cr. R. F.S.
150. Advanced Golf. (0-2) Cr. R. S.

Leadership Activities
161. Management of Sports. (0-2) Cr. R. F.W.S.
162. Sports Officiating. (0-2) Cr. R. F.W.S.

Co-Educational Activities
171. Beginning Social Dancing. (0-2) Cr. R. F.
172. Advanced Social Dancing. (0-2) Cr. R. F.
173. Beginning Square Dancing. (0-2) Cr. R. W.
174. Advanced Square Dancing. (0-2) Cr. R. W.

180. Track and Field Techniques, (1-4) Cr. 3. S.
181. Swimming Techniques, (1-4) Cr. 3. S.
182. Track and Field Techniques, (1-4) Cr. 8. S.
183. Swimming Techniques, (1-4) Cr. 8. F.

Prerequisite: Ability to pass First Grade swimmer's test.
182. Track and Field Techniques, (1-4) Cr. 3. S.

Prerequisite: Depth swimming and methods of teaching those skills.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite: 102 or equivalent.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: 102 or equivalent.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite:Psych. 384.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: Depth swimming and methods of teaching those skills.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite: 102 or equivalent.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: Psychology 384.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite: Depth swimming and methods of teaching those skills.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: Psychology 384.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite: Depth swimming and methods of teaching those skills.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: Psychology 384.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite: Depth swimming and methods of teaching those skills.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: Psychology 384.
182. Swimming Techniques, (1-4) Cr. 8. S.

Prerequisite: Depth swimming and methods of teaching those skills.
182. Track and Field Techniques, (1-4) Cr. 2. F.

Prerequisite: Psychology 384.
182. Swimming Techniques, (1-4) Cr. 8. S.
PHYSICAL EDUCATION FOR WOMEN

GERMAINE G. GUIOT, Ed.D., Head of Department

PROFESSOR: Barbara E. Forker, Ph.D.
ASSISTANT PROFESSORS: Madge H. Bowers, B.S.; Betty L. Toman, M.S.
Enid M. Miller, B.A.

Opportunities for Undergraduate Study

For details of state teacher certification, see Vocational Education, page 239.

The work of the department includes required courses for freshmen and sophomores and elective courses for upperclassmen. Through the intramural and club programs every woman is given an opportunity to participate in activities throughout her college years.

Iowa State College with its physical education building for women affords unusual opportunity for the development of recreational activities through this department. Besides the indoor facilities found in the women's building such as gymnasium with dressing rooms and showers, dance studio, individual activity room, swimming pool, and indoor golf and archery ranges, extensive out-of-doors facilities are provided. A sodded seventeen acre women's playfield is adjacent to the women's gymnasium. Eight hard surfaced tennis courts are available.

Freshman and sophomore students are required to enroll in physical education for six quarters.

One purpose of the physical education program is to instruct students in leisure-time activities, thus preparing them to adjust to future social and community living. The department offers various activities in team games, individual sports and rhythmic activities. The student must select one activity from each of these areas during her six quarters of required physical education, otherwise classes may be selected without restriction.

Another purpose of the department is to adapt the activities to each student's needs. A medical examination is required before registering in the College. This examination is evaluated by the medical staff of the Student Health Service. If special posture education or a restricted activity program is found necessary for a student, the department provides work in an individual activity class which is adapted to individual needs and capacities.

The state requirement of 23 credits to qualify for a minor permitting one to teach physical education, otherwise classes may be selected without restriction.

The remaining three quarters of required work may be chosen without restriction.

Courses Primarily for Undergraduate Students

121, 122, 123, 221, 222, 228. Physical Education. (0-3) Cr. 1 each year. Yr.
Activities in the following fields:
Rhythmic activities: modern dance, intermediate modern dance, advanced modern dance, tap, folk dancing, American country dances.
Individual sports: badminton, intermediate badminton, tennis, intermediate tennis, archery, bowling, golf, intermediate golf, recreational games, swimming, intermediate swimming, advanced swimming, life saving.
Team games: volleyball, basketball, hockey, softball, speedball.
Each student must select one quarter's work from each of the above fields. The remaining three quarters of required work may be chosen without restriction.

324. Physical Education. (0-3) Cr. 1. F.W.S.
324G. (0-3) Cr. O. For graduate students only.
Any activity not already used toward credit. Theoretical study of activity selected.

326. Recreational Leadership. (2-3) Cr. 3. S
Prerequisite: Two years required Phys. Ed.
Theory of play, organization and administration of play centers. Recreational programs studied and planned with leadership experience.

330. Principles of Physical Education. (4-6) Cr. 4. F
Survey of philosophies and principles of modern physical education with emphasis on health and recreation program.

338. Techniques of Rhythm and Team Games for High School Girls. (2-6) Cr. 4. W
Prerequisite: 161.
Theory and practices of skills involved. Analysis of rules and strategy.

*All students classified in 324, 326 and 330 are required to have had 2 years of physical education.
Courses for Advanced Undergraduate and Graduate Students

590H. Special Topics. Cr. 1 to 5.
For description, see General Vocational Education, page 241.

PHYSICS

GERALD W. FOX, Ph.D., Head of Department


INSTRUCTOR: Robert W. Green M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in physics, leading to the degree of Bachelor of Science, see page 97.

The curriculum in science with a major in physics is quite flexible. It is designed to prepare a student for work in a research or engineering laboratory or for technical work associated with the testing of manufactured products. It also affords an excellent training for graduate work in physics leading to advanced degrees. By taking the required courses in education, students majoring in physics are well prepared for teaching at the secondary school level.

Undergraduate majors in this department usually have included the following basic courses in their programs: 211, 212, 213 or 221, 222, 223; 311 (3 quarters); 425, 454, 455 (generally scheduled in the junior year) 484, 486, 487, 494, 495, 496 (generally scheduled in the senior year). As supporting work, undergraduate majors find the following courses desirable: Math. 101, 102, 103; 211, 212, 213; 314, 315; 451, 452, 453; Chern. 101, 102, 103. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Opportunities for Graduate Study

The department offers work leading to the degrees of Master of Science and Doctor of Philosophy in physics, and minor work to students taking major work in other departments. Facilities of the department and of the Institute for Atomic Research, with which it is closely associated, permit theoretical and experimental investigations in many specialized fields, including solid state physics, nuclear physics and biophysics.

A special program in biophysics has been designed to enable students interested in this important field to acquire a broad understanding of the fundamentals of physics, biology and chemistry, and an adequate preparation in mathematics. Only well-qualified students will be accepted for study in this coherent program in biophysics.

Students with bachelor's degrees will ordinarily qualify for graduate work provided their training has included sufficient emphasis on physics, mathematics, and chemistry.

Students who expect to become candidates for higher degrees in physics may find it necessary to acquire additional training at the intermediate level before undertaking more advanced work.

Ordinarily, students majoring in physics will minor in mathematics, chemistry, biology, or some field of engineering or agriculture, although other fields are also possible.
Courses Primarily for Undergraduate Students

105. Physics for Home Economic Students. (4-3) Cr. 4. F.W.S.

Electrical heat, electricity and light applied to the home.

204. Physics for Agricultural Students. (3-0) Cr. 3. F.W.S.

Prerequisite: Math. 101.

Selected topics in physics applicable to agricultural processes.

211, 212, 213, 218. General Physics.

Prerequisite: Math. 102 or 112.

For science students.

211. Mechanics.

212. Heat, electricity, magnetism.

213. Sound, light, and topics from modern and nuclear physics.

221, 222, 223. General Physics.

Prerequisite: Math. 5 or 6 each. Yr.

For engineering students.

221. Mechanics.

222. Heat, light, modern physics.

223. Sound, magnetism, electricity.

204. Heat. (8-0) Cr. 3. F.

Temperature, expansion, specific heat, convection, conduction, gas laws, kinetic theory, change of state, elementary thermodynamics, radiation, thermal and adiabatic changes, measurement of high and low temperatures.

235. Descriptive Meteorology. (3-0) Cr. 3. F.

Significant weather processes. Composition, properties, structure of the atmosphere, condensation and precipitation, wind-pressure relations, air masses and fronts, cyclones and anti-cyclones.

230. General Oceanography. (8-0) Cr. 3. W.


239. Introduction to Exploration Geophysics. (Geol. 320) Cr. 3. F.

Prerequisite: Geol. 202, credit or classification in 218 or 228, or permission of instructor.

Application of physical tools to the location of petroleum or mineral deposits, seismograph, gravimeter, magnetometer, and electrical and radioactivity measuring devices.

311. Physical Measurements. (8-0) Cr. 2 each time elected. F.W.S.

Prerequisite: 212 or 222. Math. 213.

Experiments in electricity, optics, heat and other fields with emphasis on the effect of instruments, or the experimental method on the result.

341, 342, 343. General Meteorology. (3-8) Cr. 4 each. F.W.S.

Prerequisite: 212 or 222. Math. 212.

341. Theoretical and structural studies of the atmosphere. Hydrostatics, thermodynamics, stability, radiation and heat balance; meteorological observations and instruments; weather maps, codes and charts.

342. Equations of motion; geostrophic gradient, thermal and isallobaric winds; air masses, fronts, cyclones and anticyclones.

343. General circulation; turbulence; condensation and precipitation; atmospheric electricity and optics; climatic fluctuations.

General Astronomy. (3-0) Cr. 3. S.

Prerequisite: 213 or 222.

General coordinates, time, the moon, solar and lunar eclipses, the solar system, stars, star clusters, the galactic and extragalactic systems.

421, 422, 423. Introduction to Modern Physics. (8-0) Cr. 3 each. Yr.

Prerequisite: 213 or 223, Math. 215, Chem. 103.

Wave motion; kinetic theory of gases; specific heat and heat radiation, thermodynamics; photoelectric effect; special theory of relativity; X-rays, radioactivity and isotopes, nuclear physics, nuclear fission; cosmic rays.

424. General Geophysics. (2-0) Cr. 2. W.

Prerequisite: 213 or 223, Math. 218.

Optical constants of mirrors and lenses, image formation, aberrations, optical instruments, lens combinations.

425. Physical Optics. (4-0) Cr. 4. S.

Prerequisite: 213 or 223, Math. 218.

Wave theory, absorption, dispersion, interference, diffraction, gratings, resolving power.

435. Nuclear Physics for Engineers. (3-0) Cr. 3. F.

Prerequisite: 213, or 228, Math. 218.

Introduction to nuclear physics, nuclear reactions, particle accelerators, nuclear fission.


450. Analytical Physics Laboratory. (0-3 to 9) Cr. 1 to 3 each time elected. F.W.S.

Prerequisite: Permission of instructor.

This course is equivalent to undergraduate work. Registration will ordinarily be limited to one credit during the first quarter.

454, 455. Intermediate Mechanics. (Math. 454, 455) (3-0) Cr. 3 each. Yr.

Prerequisite: 213 or 223, Math. 314.

Particle dynamics, simple harmonic motion, central forces; studies and dynamics Lagrangian and Hamiltonian systems.

454. Atomic Physics. (3-0) Cr. 3. F.

Prerequisite: 213 or 223, Math. 213, Chem. 103.

Electrical effects of electricity and magnetism, elementary charged particles, electromagnetic radiation, waves and particles, the hydrogen atom, atomic spectra and electron distribution.

456. Elementary Physics. (9-0) Cr. 3. W.

Prerequisite: 454.

Statistical electron theory of metals. Fermi-Dirac-Sommerfeld function, completely degenerate function, exclusion principle, uncertainty principle, electronic specific heats, thermionic emission, contact potentials, retardation and accelerating fields.

487. Linear Physics. (3-0) Cr. 3. S.

Prerequisite: 484.

Nuclear physics; nuclear radioactivity, detection of radiation, induced radioactivity apparatus; alpha, beta, and gamma rays; neutron production, detection, and mesons; cosmic radiation; nuclear fission.

490. Special Problems. Cr. 1 to 6 each time elected. F.W.S.

Prerequisite: 431, 432, or equivalent.

494, 495, 496. Electricity and Magnetism. (3-0) Cr. 8 each. F.W.S.

Prerequisite: 213 or 223, Math. 315.

Electrostatics, magnetostatics, steady cur-
Courses for Advanced Undergraduate and Graduate Students

508. Micrometeorology. (3-0) Or. S. S. Prerequisite: 843. Mr. Carman
Fundamental meteorological processes occurring in the layer of air near the ground; heat exchange, radiative transfer, water vapor transfer; influence of topography, vegetation cover and soil conditions on the microlayer.


521. General Laboratory in Experimental Physics. (0-9) Or. 8 each time taken. F.W.S.
Prerequisite: Permission of instructor. Messrs. Hudson, Bowen
A series of experiments illustrating the techniques of measurement in current experimental physics, dealing with electrical circuit techniques, simple physics, sound, nuclear physics, heat, spectroscopy, geometrical and physical optics. Principal emphasis on treatment of both random and systematic errors and on methods of obtaining and interpreting data to obtain results of desired accuracy and reliability.

536, 537. Nuclear Physics for Engineers. (3-0) Or. 3 each. W.S.
Prerequisite: 436 or 437 or 538; Math. 314 or 315 or permission of instructor. Mr. Stebbins
Diffusion of neutrons, homogenous and heterogeneous reactors, reactor control, perturbation theory, transport theory.


Courses for Graduate Students

605. Empirical Spectroscopy. (3-0) Or. 3. Alt. S. Offered 1958
Prerequisite: 425. Mr. Earls
Atomic energy levels, using the vector model of the atom; fine structure, hyperfine structure, perturbations, line breadths. Brief survey of molecular spectra in theory and experiment.

611, 612, 613. Solid State Physics. (3-0) Or. 3 each. Yr.
Prerequisite: 553, 593, credit or classification in 681 or permission of instructor. Mr. Good
Modern theory of metals, semiconductors and insulators. Topics include band theory, cohesion, specific heats, electrical and thermal conductivities, Hall effect, rectification and transistor physics, magnetic orientation, electronic processes in ionic crystals, dislocation theory and order-disorder phenomena in alloys.

621, 622, 623. Thermodynamics, Kinetic Theory and Statistical Mechanics. (3-0) Or. 3 each. Yr.
Prerequisite: Math. 514. Mr. Swenson
(621) First and second laws of thermodynamics, thermodynamic potential functions, systems in various states of aggregation, gaseous systems, dilute solutions and other applications.

(622) Kinetic distribution laws, the H theorem, transport and fluctuation phenomena.

(623) Statistical ensembles in classical mechanics and quantum mechanics, statistical basis of thermodynamics, applications to specific problems.


631, 632, 633. Nuclear Physics. (3-0) Or. 3 each. Yr.
Prerequisite: 591, 592 or permission of instructor. Mr. Corden
Nuclear systems, experimental techniques; energy loss of particles and radiation in matter, alpha, beta, and gamma transitions, nuclear forces, two-body problems, nuclear models, nuclear reactions, mesons, cosmic rays.

634. Advanced Optics. (3-0) Or. 3. F.
Prerequisite: 425. Mr. Earls
Plans and elliptically polarized light and interference; optical activity; wave surfaces in uniaxial and biaxial crystals; elements of electromagnetic wave theory; Lorentz dispersion theory; optical reflection and refraction in metals, fluorescent phenomena and other topics.

640. Special Topics. F.W.S.
Prerequisite: Permission of instructor.

654, 655. Dynamics. (3-0) Or. 3 each. Yr.
Prerequisite: 554, 555. Mr. Swenson
See Mathematics.

660. Advanced Biophysics. (3-0) Or. 3 each. Yr.
Prerequisite: 496, Math. 314, 614, and 550 or equivalent. Mr. Laseit
Electrostatics, magnetostatics, potential problems, steady electric currents, magnetic materials, electromagnetic waves.

499. Seminar. (1-0) Or. 1. F.W.S.
netic field of currents, electromagnetic field equations, electromagnetic induction, magnetic materials, alternating currents, radiation, and transmission of electromagnetic waves.

681. 682. 683. Quantum Mechanics. (Math. 681, 682, 683) (3-0) Cr. 3 each. Yr.

POULTRY HUSBANDRY

ROBERT E. PHILLIPS, Ph.D., Head of Department

PROFESSORS: Leonard Z. Eggleton, M.S.; Arne W. Nordskog, Ph.D.; Robert Penquite, Ph.D.


INSTRUCTORS: Lewis T. Smith, M.S.; Paul R. Walther, B.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in poultry husbandry leading to the degree of Bachelor of Science, see page 57.

Employment opportunities for poultry graduates are unlimited. The demand has never been satisfied. Major students are employed by hatcheries, specialized poultry farms (including breeding farms), feed manufacturing organizations, poultry and egg processing plants, poultry equipment and supply companies, publishers and as poultry specialists by state and federal agencies.

Educational opportunities in the Department of Poultry Husbandry include broad training in all phases of the poultry industry which relates to the production, processing, storage and distribution of poultry and egg products. Departmental courses include hatchery and poultry farm management and administration, poultry nutrition, housing, incubation, breeding, processing and marketing and courses in the management phases associated with meat and egg production.

The poultry husbandry curriculum also includes course work in the social and basic sciences, so as to provide the graduating student with a satisfactory background which will qualify him to enter either specialized commercial fields of work or to continue advanced academic study. A number of elective courses is permitted in the curriculum in order that students may select, in consultation with the departmental staff, other fields of study of special interest to them.

Opportunities for Graduate Study

Major work for the degrees of Master of Science and Doctor of Philosophy is offered by the Poultry Husbandry Department in the fields of nutrition, breeding, physiology and poultry products technology. Excellent courses are offered in other departments for minor work in specialized fields to supplement the major field of study.

A strong undergraduate program is required of those students interested in undertaking graduate study in this department. Fundamental training in biology, chemistry, mathematics, statistics and other related fields is a prerequisite to a satisfactory graduate program.

Open to graduate students for minor only: 401, 404.

Courses Primarily for Undergraduate Students

101. General Poultry Husbandry. (3-0) Cr. 3. E.W.S. Principles and practices of poultry production. Classification of breeds, culling, judging, housing and feeding. Introductory course for those who expect to specialize in poultry; arranged also for those who wish a single course in poultry husbandry.


103. Turkey Production. (2-2) Cr. 3. S. Prerequisite: 101. Development of the turkey industry and the commercial production of hatching eggs, poult and mature stock. Trips to nearby farms.

Co-efficients and methods of selection.

603. Poultry Production Projects. (3-0) Or. B. S. Not offered 1958.
Prerequisite: A.H. 350. Research problems in poultry production projects.

Prerequisite: A.H. 350 or equivalent. V.Phys. 364. Mr. Balloun.
Requirements, interaction and metabolism of nutrients by chickens and turkeys. Development and testing of experimental diets, including deficiency studies.

605. Methods and Techniques in Animal Nutrition Experimentation. (A.H. 608) (2-3) Cr. 3. S.
Prerequisite: Stat. 401 or equivalent. Messrs. Balloun, Burroughs, Catron, Jacobson. Methods and techniques in planning and conducting nutrition experiments with poultry, swine, cattle, and sheep. Includes visits to experimental facilities.


Prerequisite: A.H. 350. Mr. Nordskog.
Survey of poultry genetics. Application of systems of breeding to poultry, including inbreeding, outbreeding, hybridization and methods of selection.

Prerequisite: A.H. 350 or equivalent.

Prerequisite: A.H. 350 or equivalent. V.Phys. 364. Mr. Balloun.
Requirements, interaction and metabolism of nutrients by chickens and turkeys. Development and testing of experimental diets, including deficiency studies.


B. Poultry Nutrition. Mr. Balloun.
C. Avian Physiology. Mr. Phillips.
D. Poultry Products Technology. Mr. Phillips.

PSYCHOLOGY

WILLIAM A. OWENS, Ph.D., Head of Department

PROFESSORS: John A. Bath, Ph.D.; John E. Evans, Ph.D.; Martin F. Fritz, Ph.D.; Glenn R. Hawkes, Ph.D.; Alvah R. Lauer, Ph.D.; Thomas F. Vance, Ph.D.

ASSOCIATE PROFESSORS: Don C. Charles, Ph.D.; James T. Freeman, Ph.D.; D. Bruce Gardner, Ph.D.; Thomas E. Hannum, Ph.D.

ASSISTANT PROFESSORS: Arthur C. MacKinney, Ph.D.; Woodrow W. Reed, Ph.D.; Leroy Wolins, Ph.D.

INSTRUCTOR: Virtus W. Suhr, Ph.D.

Opportunities for Undergraduate Study

For the undergraduate curriculum in science, major in industrial psychology, leading to the degree of Bachelor of Science, see page 97.

The curriculum in science with a major in applied psychology is flexible and may be pursued, with variations, in preparation for such types of positions as the following: (1) test technician, (2) interviewer, (3) job or safety instructor, (4) employee counselor,
(5) student adviser, (6) psychological interne, (7) driver training instructor, (8) personnel technician, (9) *junior professional assistant, (10) *junior management assistant, and (11) safety supervisor. A general nontechnical major may also be taken. Whereas there are many types of positions available to holders of the Bachelor of Science degree with a major in applied psychology, students should realize that in order to secure employment as professional psychologists it is ordinarily necessary to possess the Master of Science or Doctor of Philosophy degree.

The following courses are especially recommended to non-majors preparing for industrial employment: 174, 254, 284, 285, 340, 434, 448, 464, 465, 466, 474, 534, 538, 553, 555.

The following courses are recommended to non-majors with primary interests in social science or education: 174, 234, 334, 340, 370, 415, 434, 448, 474, 515, 516, 525, 538, 542, 555. Psych. 104, 234 and 334 will meet the psychology requirement for an Iowa Professional Certificate.

Psych. 174, 370 and 372, plus 6 hours from 320, 474, 570 or 574 will meet the requirements of the State Department of Public Instruction for the teaching of Driver Education and Safety.

Undergraduate majors in this department usually have included the following basic courses in their programs: 104, 304, 306, 234 and/or 334, 340, 434, 448, 464, and/or 465. As supporting work, undergraduate majors have found the following courses desirable: Gen. 300; Math. 101, 112, 113 or Stat. 201; Phys. 211, 212, 213 or Chem. 101, 102, 103; Soc. 134; Zool. 104, 105, 303. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the number of basic non-specialized studies which may be needed.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in certain fields of applied psychology; and minor work to students taking major work in other departments.

Students desiring a graduate major in psychology must have been graduated from a recognized technical or professional curriculum substantially equivalent to one of the undergraduate curricula of Iowa State College. Prerequisite to admission is at least 15 quarter credits of basic psychology, which should normally include a laboratory course, a quantitative or methods course, and a course with developmental emphasis.

Open to graduate students for minor only: 415, 434, 448, 474.

Courses for Noncollegiate Students

10. Academic Learning Skills.
(2-0) Or. 0. F.W.S.
Prerequisite: Permission of Instructor.
Efficient methods of studying and reading.

Courses Primarily for Undergraduate Students

104. General Psychology.
(3-0) Or. 3. F.W.S.
Introductory principles of psychology with particular reference to applications in the areas of educational, vocational, personal, and social adjustment.

(3-0) Or. 3. F.W.S.
Survey of highway, industrial, farm and home safety and safety organizations. Principles of accident prevention; individual and group responsibilities.

234. Developmental Psychology.
(8-0) Or. 8. F.W.S.
Prerequisite: 104.
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.

78. Automobile Driving Course.
(3-0) Or. 3. F.W.S.
For those learning to drive an automobile. (For fee see page 19.)

(3-0) Or. 3. F.W.S.
Prerequisite: 104.
Major problems and application of psychological principles in such fields as law, medicine, business and industry, selling and advertising, guidance and personnel.

284. Psychology of Advertising.
(3-0) Or. 3. F.W.S.
Prerequisite: 104.
Investigational approaches, analysis and evaluation of all types of advertising materials with respect to the psychological principles involved.

(3-0) Or. 3. P.S.
Prerequisite: 104.
Psychological principles underlying sound and successful salesmanship. Persuading the customer, breaking down sales resistance, ethical considerations.

*These are civil service appointments.
Advanced General Psychology. (3-0) Cr. 3. F.W.
Prerequisite: 104.
Experimental analysis of behavior; fundamental principles.

Introductory Laboratory in Psychology. (2-3) Cr. 3. W.S.
Classification in 304.
Experimental analysis of behavior; laboratory methods.

Special Problems in the Psychology of Safety. Cr. 1 to 3 each time elected. F.W.S.
Prerequisite: 6 credits in Psychology and permission of instructor.

Educational Psychology. (3-0) Cr. 3. F.W.
Prerequisite: 334.
Consideration of variables influencing learning. Emphasis upon principles of learning and forgetting, motivation for learning transfer, educational measurement, and development of understanding.

Mental Hygiene (3-0) Cr. 3. F.W.
Prerequisite: 104.
Concepts of normality and adjustment with experimental evidence; implications of the principles for the normal and personal and developmental applications.

Theory and Principles of Driver Education. (3-0) Cr. 3. W.S.
Prerequisite: 6 credits in Psychology.
Source materials, methods, policies and procedures, and psychological aspects of driver education; techniques and interpretation.

Practices of Driver Education. F.W.S.
Cr. 1 to 3 each time elected, total no more than 4.
Prerequisite: 370, permission of instructor, possession of an Iowa driver’s license.
Organization of, and experience with, both classroom and behind-the-wheel phases of driver education; lesson plans, films, scheduling and testing techniques.

Psychology of Exceptional Children. (3-0) Cr. 3. S.
Prerequisite: 224 or C.D. 336.
Psychological problems in the educational and personal adjustment of children with defects of vision, hearing, speech, intellect and personality.

Courses for Advanced Undergraduate and Graduate Students


History of Psychology. (2-0) Cr. 2.
Prerequisite: 9 credits in Psychology.
Mr. Charies
Phenomenological, physical and clinical origins of psychology; points of view and interpretations of basic phenomena.

Social Psychology. (3-0) Cr. 3. W.
Prerequisite: 9 credits in Psychology.
Mr. Charles
Interplay of the individual with the group as affected by race, nationality, religion and other social phenomena.

Advanced Developmental Psychology. (3-0) Cr. 3.
Prerequisite: 15 hours (including Psych. 284 or C.D. 386) or graduate standing.
Mr. Charles
Methods and conclusions of current major researchers in developmental psychology. Analysis and evaluation.

Special Topics. Cr. 1 to 4 each time elected. F.W.S.
Prerequisite: 6 credits in psychology and permission of instructor.
A. Historical, Systematic, Theoretical.
B. Safety.

Quantitative Concepts in Psychology. (3-0) Cr. 3. W.
Prerequisite: 6 credits in psychology.
Illustration and interpretation of the most frequently employed statistical and psychological techniques. Preparation and instruction for intelligent reading of the psychological literature; not primarily computational.

Tests and Educational Measurement. (2-2) Cr. 3. F.S.
Prerequisite: 6 credits in psychology.
Administration, scoring, profiling and interpretation of standardized group tests of intelligence, achievement, special aptitudes, interest and personality. Construction and evaluation of teacher-made tests.

Public Opinion and Attitude Analysis. (3-0) Cr. 3. S.
Prerequisite: 3 credits in psychology and either 483 or 8 credits in statistics.
Determinants of opinion and attitude; formulation of questions and scales; psychometric methods; sampling; social implications and applications of polls and surveys.

Industrial Psychology. (3-0) Cr. 3. F.W.S.
Prerequisite: 104.
A discussion of the content and methods of industrial psychology; selection techniques, merit rating, employee counseling, attitudes and morale, training, leadership and job evaluation.

Human Engineering. (3-0) Cr. 3. F.S.
Prerequisite: 104.
The application of experimental psychology to man-machine relationships; inclusion of normal characteristics and factors influencing work output.

Psychology of Industrial Training. (3-0) Cr. 3. W.
Prerequisite: 104.
Principles of learning, training, and employee development in industry. Types of training programs, their objectives, the selection of trainees, identifying training needs, training methods and their evaluation.

Human Utilization. (3-0) Cr. 3. S.
Prerequisite: 6 credits in Psychology.
The causes of accidents; methods and techniques of accident prevention; appraising and improving motivation and morale; utilizing aged and handicapped workers.

Advertising and Sales.
D. Genetic and Geriatric.
E. Experimental.
F. Educational and Learning.
G. Individual Differences and Psychometrics.
H. Clinical and Abnormal.
J. Personnel, Counseling.
K. Industrial.

Individual Differences (2-0) Cr. 2. S.
Prerequisite: 484. Mr. Owens
Evaluation of roles of sex, race, the family, environment and maturity in their contribution to individual differences; techniques analyzed; trait differences compared and contrasted with individual development.

Individual Testing. (1-4) Cr. 3. W.
Prerequisite: 9 credits in psychology, including 484, and permission of instructor.
Mr. Fritts
Basic assumptions and fundamental procedures; 45 hours supervised practice in administration and interpretation of Stanford-Binet and/or Wechsler.

Advanced Tests and Measurements. (3-0) Cr. 3. W.
Prerequisite: 484 and Stat. 401, or equivalent. Mr. Owens
Test theory, development and evaluation, basic variables, qualifying concepts, current trends.

533. Counseling Tools and Techniques. (3-0) Cr. 3. S.
Prerequisite: 434 and permission of instructor.
Theory and practice of personal counseling; with applications to educational, vocational and industrial problems.

542. Theory of Personality and Adjustment. W.
Prerequisite: 15 credits in psychology or graduate standing.
Development of personality theories; implications for research and application to problems of adjustment.

544. Abnormal Psychology. (3-0) Cr. 3. S.
Prerequisite: 9 credits in psychology; neurophysiology recommended.
Abnormal mentality and mental disorders which affect individual adjustments: causation, diagnosis, prognosis, probable course and treatment of mental disease. Clinics in school for feeble-minded and hospital for insane.

555. Psychology of Learning. (3-0) Cr. 3. S.
Prerequisite: 15 credits in psychology, including 464 or equivalent.
Principles, types and bases of learning; theories and systematic implications.

565. Methods in Industrial Psychology. (3-0) Cr. 3. S.
Prerequisite: 9 credits in psychology, including 464 or 484.
Methodological approaches to industrial selection, classification, training, and efficiency at work.

Courses for Graduate Students

620. Research.
Messrs. Charles Evans, Freeman, Fritz, Lauer, Owens, Vance

624. Logic of Psychological Research.
(3-0) Cr. 3. S.
Principles and logic of science as applied to psychology and to the design of psychological investigations.

639. Internship in Psychological Counseling. S.
Prerequisite or corequisite, 538 and permission of instructor. Mr. Fritz
Supervised practice in the guidance application of testing, interviewing and counseling; weekly evaluative clinics.

RADIO AND TELEVISION TRAINING PROGRAM

Advisory Committee: Joseph H. North, Ph.D., Chairman
Coordinator of Radio and Television Education


Iowa State College, a pioneer in educational broadcasting, has owned and operated its own non-commercial radio facilities since 1922. The college station, WOI, has served as one of the major agencies of off-campus and extension education throughout Iowa and surrounding states.

A frequency modulation station, WOI-FM, began operation in 1949. With construction of WOI-TV in 1950, the college became the first educational institution in the United States to operate its own television station.

The college also operates a television laboratory and classroom equipped with two Image Orthicon cameras, a vidicon film pickup chain, three-speed turntables, portable studio and on-line monitors, as well as other equipment which would be found in a professional broadcasting studio. The television laboratory and classroom are utilized for experience by newer students in the training program, and for experimentation by advanced students.

Courses in programming, production, performance, writing and management for both the professional and non-professional student are offered in the departments of Applied Art, Architecture, Economics, Electrical Engineering, English and Speech, Household

568. Readings in Experimental Psychology. (3-0) Cr. 3. W. Mr. Freeman
Prerequisite: 306.
Literature pertaining to the systematic analysis of behavior; behavior theory.

569. Laboratory in Human Engineering. (2-4) Cr. 4. S.
Prerequisite: 465. Mr. Freeman
Laboratory exercises in human engineering problems. Design of equipment from standpoint of human operator.

170. Administration and Supervision of Human Conservation and Accident Prevention Programs. (3-0) Cr. 3. SS.
Prerequisite: 370 and 474.
Mr. Lauer
Effective methods of developing the background and motivation essential to accident prevention at various educational levels.

574. Seminar. Psychology of Safety. (2-0) Cr. 1. SS.
Prerequisite: 9 credits in psychology and education; permission of instructor. Mr. Lauer
Review of literature in field of safety; presentation of reports based upon reading and research.

596. Seminar in Applied Psychology. (2-0) Cr. 1 each time elected. F.W.S.
Prerequisite: 15 credits in psychology.
Staff
Required of all graduate majors as long as so classified; required of graduate minors (in residence), for a period of one year. Research reports, reviews of current experimental and theoretical literature, discussion and evaluation.
Equipment, Industrial Administration, Music, Psychology, Science and Technical Journalism. A program in radio and TV engineering for the technical student is provided in the electrical engineering curriculum.

Undergraduate students who desire radio and television training may arrange a sequence of subjects to prepare themselves for this work by consulting with the Coordinator of Radio and Television Education and the professor in charge of their major concentrations. In the Division of Agriculture, each curriculum contains sufficient electives to provide this training, particularly agricultural journalism. Several curricula in the Division of Home Economics have enough elective credits to permit combining preparation in the field of radio or television with the prescribed curriculum. See recommended courses noted with the curricula for applied art, child development, experimental cookery, household equipment and textiles and clothing on pages 82, 83, 84, 90 and 92. In the Division of Engineering, the requirements for technical electives are stringent. The student interested in radio or television training should consult with the head of his chosen department. The curriculum in science offers opportunity for this training either as a complementary part of the area of major concentration or as fields within the major in general science.

Students interested in minor ing in radio and television, or concentrating heavily in this area by enrolling in the flexible general science major of the curriculum in science (see page 97) may choose from the following courses: A.A. 241, 242; Arch. 214, 217; Ec. 305, 444; E.E. 315, 316; Engl. 315; H.Eq. 315; I.Ad. 340, 365, 384, 425, 480; Music 144, 344; Psych. 284, 285, 448; Sci. 205, 206, 405, 410; Sp. 301, 302, 303, 307, 328; T.JI. 317, 326, 430, 475, 476, 481, 482, 483. See departmental listings for course descriptions and prerequisites.

Qualified students anticipating a career in radio and television are sent out during the summers to commercial and educational stations as apprentices.

Graduate students qualifying for advanced degrees in subject matter fields may use radio or television courses as "supporting work" for their programs. Consult the Dean of the Graduate College for details.

Further information regarding the radio and television training program may be obtained from Joseph H. North, Coordinator of Radio and Television Education, 102 Building F, Iowa State College, Ames, Iowa.

**SCIENCE**

**RICHARD S. BEAR, Ph.D., Dean, Division of Science**


**Associate Professor:** Orlando C. Kreider, Ph.D.

**Assistant Professor:** Delma Harding, Ph.D.

**Opportunities for Undergraduate Study**

For undergraduate curriculum in science leading to the degree of Bachelor of Science, see page 95.

The curriculum in science is planned to meet the needs of the following classes of students:

Those who are interested in science as related to the practical aspects of industry, commerce, agriculture, engineering, home economics, and veterinary medicine.

Those who desire thorough, fundamental preparation for research in the sciences or for teaching the sciences at the secondary and collegiate levels.

Those who have not made a definite decision as to their vocation, and who desire an education that is strong and well-balanced in the sciences and general studies as a foundation for further scientific or professional study, or as a preparation for intelligent citizenship.
Courses Primarily for Undergraduate Students

205. Television Workshop. Required. (1-3 to 9). F.W.S. Students interested in television as a vocation will work as members of the floor crew at WOI-TV.

206. Television Workshop. (1-3 to 9). Credit 1 to 8 each time elected with maximum total of 6 credits. F.W.S. Prerequisite: 205 (two quarters) or permission of instructor.

405. Television Laboratory. (0-9 or 15) Or. 8 or 5 each time elected. F.W.S. Prerequisite: Permission of instructor. Students who have emphasized in their earlier work such specialties as directing, newscasting, writing, producing, lighting, staging, demonstrating, will work together here to produce shows over WOI-TV.

410. Radio Laboratory. (0-9 or 15) Or. 8 or 5 each time elected. F.W.S. Prerequisite: Permission of instructor. Students who have emphasized in their earlier work such specialties as directing, newscasting, writing, producing, announcing will work together here to produce shows over WOI-AM-FM.

417. Observation and Supervised Teaching in the Sciences. (V.Ed. 417) Cr. 2 to 10 each time elected; maximum permitted 12 credits. F.
Prerequisite: V.Ed. 395; Engl. 394 or Math. 497 or Sci. 486 or 498; permission of the dean; advance reservation required.

486. Methods of Teaching Science. (3-0) Cr. 3. W. Prerequisite: 15 credits in subject matter field; permission of the dean. Field trips.

496. Methods of Teaching Social Studies. (3-0) Cr. 3. W. Prerequisite: 15 credits in subject matter field; permission of the dean. Field trips.

SOCIOMETRY
For description of courses, see Department of Economics and Sociology, courses in Sociology, page 159.

SOILS
For description of courses, see Department of Agronomy, courses in Soils, page 121.

SPEECH
For description of courses, see Department of English and Speech, courses in Speech, page 167.

STATISTICS
Theodore A. Bancroft, Ph.D., Head of Department

Professors: Herman O. Hartley, D.Sc.; Paul G. Homeyer, M.S.; Raymond J. Jessen, Ph.D.; Oscar Kempthorne, M.A.; George W. Snedecor, M.A.; Gerhard Tintner, Ph.D.

Associate Professors: John Gurland, Ph.D.; David V. Huntsberger, Ph.D.; Emil H. Jebe, Ph.D.; Norman V. Strand, M.S.

Assistant Professors: Robert J. Buehler, Ph.D.; Herbert T. David, M.A.; Campbell C. Mosier, B.S.

Instructors: Marion Bryson, M.A.; Mary A. Clem; Martin R. Dorff, M.S.; Howard W. Jespersen, Jr., M.S.; Basilio Rojas, M.S.; Howard Taylor, M.S.; Robert F. White, M.S.

Opportunities for Undergraduate Study
For the undergraduate curriculum in science, major in statistics, leading to the degree of Bachelor of Science, see page 97.

The curriculum in science with a major in statistics is designed to prepare students for (1) graduate study in statistics, and (2) positions as assistants to research workers 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 to industrial design and specifications; operations research to analyze the performance of men, 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 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: 201, 341, 342, 401, 402, 411, 421, 481, 482. As supporting work, undergraduates have found the following courses desirable: Math. 101, 102, 103, 211, 212, 213. It is also advisable to have a strong minor in a field of application. These lists of courses are not to be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Students intending to do graduate work in statistics would normally take additional courses in mathematics.

**Opportunities for Graduate Study**

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in statistics; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of an undergraduate curriculum essentially equivalent to the curriculum in science at this institution together with a year of calculus and a knowledge of statistical theory and methods as contained in Stat. 341, 342, 401, 402.

Open to graduate students for minor only: 401, 402, 411, 421, 431, 438, 446, 447, 448, 481, 482.

**Courses Primarily for Undergraduate Students**

201. Principles of Statistics. (4-3) Cr. 5. F.W.S.
Prerequisite: 2 credits in mathematics. Statistical concepts in modern society; frequency distributions; elements of statistical inference; introduction to regression, correlation; contingency tables; the role of statistical methods in surveys, experiments, and industrial applications.

227. Elementary Business Statistics. (2-3) Cr. 3. E.
Prerequisite: 201 or 401. Applications of statistical principles to business sources of data; methods of presenting statistical material, elementary discussion of index numbers, time series, forecasting, quality control and market research.

341, 342. Introduction to Theory of Statistics. (Math. 341, 342) (8-0) Cr. 3 each. F.W.
Prerequisite: Math. 212. Probability; distribution functions and their properties; sampling distributions; theory of estimation and tests of hypotheses; linear hypotheses, regression, and correlations.

401, 402. Statistical Methods for Research Workers. (3-3) Cr. 4 each. F.W.
Prerequisite: One course in Statistics and one course in Mathematics, or permission of the instructor. The role of statistics in research. Introduction to the methods of analyzing data from experiments and surveys.

411. Experimental Design for Research Workers. (3-9) Cr. 3. S.
Prerequisite: 402. Methods of constructing and analyzing designs for experimental investigations; Latin-square, split-plot, simple and partially confounded factorial designs, incomplete block designs; treatment of missing data; techniques of experimentation.

421. Survey Designs for Research Workers. (3-0) Cr. 3. S.
Prerequisite: 401. Methods of constructing and analyzing designs for survey investigations; simple random, stratified, multistage and multiphase sampling designs; questionnaire construction; methods of estimation; techniques of survey investigation.

431. Elementary Statistical Quality Control. (8-0) Cr. 3. S.
Prerequisite: 201 or 401 or I. E. 322 and junior classification. Application of statistical principles to manufacturing. Survey of control chart technique and sampling inspection schemes now in use.

438. Economic Statistics. (Ec. 438) (8-0) Cr. 3. S.
Prerequisite: 402. Analysis of economic data obtained through research investigations. Applications of regression techniques to production functions, demand functions, cost functions, etc. Brief treatment of index numbers.

446. 447, 448. Statistical Theory for Research Workers. (3-0) Cr. 3 each. Yr.
Prerequisite: Graduate classification and one year of college mathematics. (447) Prerequisite: 446 or Math. 212. (448) Prerequisite: 447. Primarily for graduate students not majoring in statistics. Emphasis on the aspects of the theory underlying statistical methods. Probability, population distribution functions and their properties.
Courses for Advanced Undergraduate and Graduate Students

501. Intermediate Statistical Methods. (3-0) Cr. 3. F.
Prerequisite: 402 and permission of instructor. Mr. Snedecor
Special situations in analysis of variance, multiple comparisons, fitting of polynomial and non-linear regressions, extension of contingency correlation and sampling problems.

505. Psychological Statistics. (Psych. 505) (3-0) Cr. 3. S.
Prerequisite: 401 and 402 or permission of instructor.
Applications of topics in factor analysis, canonical regression and correlation; and discriminant function analysis.

511, 512. Design of Experiments. (8-0) Cr. 3 each. S.
Prerequisite: 402 or 501. Mr. Kempthorne
Principles of statistical design for experimental investigations in biological, agricultural and industrial research; tests; estimation, randomized blocks; Latin-square, Graeco-Latin squares; 2^k and other factorial systems; fractional replication; simple split-plot trials; introduction of quasi-factorial and incomplete block designs; determination of Optima.

521, 522. Design of Surveys. (5-2) Cr. 4 each. S.
Prerequisite: 521 (8-0) Cr. 3. S.
Messrs. Hartley, Jessen
Statistical designs and techniques for survey investigations. Mathematical development of sampling systems; sampling units; estimation; sample size; costs, non-sampling problems. Methods of obtaining secondary data.

531. Industrial Statistics: Sampling Inspection. (8-0) Cr. 3. S.
Prerequisite: 522 or 440.
Control of quality of manufactured products; attribute and variables inspection; single, double, and sequential plans; sampling plans for continuous production.

532. Industrial Statistics: Design of Experiments. (3-0) Cr. 3. S.
Prerequisite: 402, 531.
Principles and methods of designing industrial experiments. Methods of analysis.

536. Biological Statistics. (3-0) Cr. 3. S.
Prerequisite: 501. Mr. Snedecor
Biological assay; quantitative and quanlital responses; dose-response curve; relative potency; LD50; biological populations; negative binomial; contagious distributions.

530. Genetic Statistics. (Gen. 530) (8-0) Cr. 3. F.
Prerequisite: 402, Gen. 500. Mr. Kempthorne
Probability as applied to genetic systems; the derivation of genetic expectations; the theory of inbreeding; estimation and testing of genetic parameters; statistical aspects of quantitative inheritance; the partition of variance; covariances among relatives; mathematical models for quantitative inheritance.

538. Elementary Econometric Statistics. (Ec. 538) (3-0) Cr. 3. F.
Prerequisite: 448. Mr. Tintner
Theory of estimation of structural economic relations in simultaneous equations systems; large sample theory and computation techniques; testing of hypotheses.

541, 542, 543, Theory of Statistics. (Math. 541, 542, 543) (8-0) Cr. 3 each. Jr.
Prerequisite: or corequisite: 342. Math. 514, 515. Mr. Bancroft
Development of distribution theory from the theory of probability; common distribution functions; derivation of sampling distributions with particular attention to normal populations; estimation by maximum likelihood; likelihood ratio tests of parametric hypotheses; introduction to general linear hypothesis theory; elements of sequential analysis; distribution free methods.

580. Scientific Machine Computing. (Math. 580) (3-0) Cr. 3. S.
Prerequisite: 508 or permission of instructor. Mr. Hartley
Programming large scale computations on high-speed computers. Components of computational program. Adaptation of program to facilities provided. Link with organization programs. Illustrated by examples including problems from Math. 507, 508 and large scale analysis of data requiring extensive input and output.

599. Special Topics. Credit as arranged.
A. Theory.
B. Methods.
C. Design of Experiments.
D. Design of Surveys.
Messrs. Bancroft, Garurd, Hartley, Jessen, Kempthorne, Snedecor, Tintner

Courses for Graduate Students

Prerequisite: 448 or 543 and 501 or permission of instructor.
Rank correlations and other ranking tests, non-parametric tests including the sign and Wilcoxon tests for randomness, basic multivariate techniques including regression and discriminant analysis, analysis of serial data and harmonic analysis. Comparisons of sample means when variances are unequal.

611, 612. Advanced Design of Experiments.
Advanced Design of Surveys.
(3-0) Cr. 3. Prerequisites: 522, 548. Mr. Hartley. Mathematical development of sampling theory for more complex cases. Unequal probabilities of selection. Cluster sampling. Selection of optimum design for practical survey problems.


Advanced Econometric Statistics.
(3c. 639) (3-0) Cr. 3. Alt. W., offered 1958. Prerequisites: 538, 543. Mr. Tintner. Distribution theory of autoregressive multiple equation systems; identification problems; applications to prediction and economic policy.

General Theory of Linear Hypothesis.
(Math. 641) (3-0) Cr. 3. F. Prerequisite: 548. Math. 404. Mr. Kempthorne. Theory of least squares; theory of general linear hypothesis; analysis of multiple classification data; components of variance.

Distribution Theory.
(Math. 642) (3-0) Cr. 3. F. Prerequisite: 543. Mr. Gurland. Probability measure and distribution functions; random variables; characteristic functions; asymptotic distributions.

(Math. 643) (3-0) Cr. 3. W. Prerequisite: 543. Mr. Gurland. Neyman-Pearson theory of testing hypotheses; point and interval estimation; sufficient statistics; elements of decision theory.

Time Series.
(Math. 646, Eq. 646) (3-0) Cr. 3. Alt. S. Not offered 1958. Prerequisite: 402 or 501, Math. 213. Mr. Tintner. Random elements; variate difference method; seasonal variations; cyclical variations; Fourier series, harmonic analysis; trend; orthogonal polynomials, correlation, economic application of multivariate analysis.

Multivariate Analysis.
(Math. 647) (3-0) Cr. 3. S. Prerequisite: 548, Math. 404. Mr. Gurland. Multivariate normal distribution; Wishart distribution; Hotelling's T; multivariate regression analysis; discriminant functions.

Recent Developments in Statistics and Probability.
(Math. 649) (3-0) Cr. 3. Prerequisite: 642, 648. Mr. Gurland. Material selected from one of the following or other modern areas which become sufficiently important: sequential analysis, decision theory, nonparametric inference, stochastic processes.

(Math. 688) Credit as arranged. Prerequisite: 543.

Research.

TECHNICAL JOURNALISM

KENNETH R. MARVIN, M.S., Head of Department

PROFESSOR: Rodney T. Fox, M.S.J.
ASSOCIATE PROFESSOR: Harry E. Heath, Ph.D.
ASSISTANT PROFESSORS: Bernice P. Burns, M.A.; Robert C. Mulhall, B.A.; James W. Schwartz, B.S.

Opportunities for Undergraduate Study

For undergraduate curricula in agricultural journalism and in home economics or science, major in technical journalism, leading to the degree of Bachelor of Science, see pages 42, 89 and 97 respectively. For a sequence in radio and television, see page 223.

Instruction in technical journalism is offered to all students and adapted as far as possible to their various needs. Its purpose is two-fold: to serve those professionally interested in technical journalism and to aid those wishing less extensive work.

To professional students it offers training for editorial positions with the technical, business, and trade press, for advertising positions with such publications and with industries, for similar positions in radio and television, and for community journalism.

A sequence of suggested courses designed to prepare students for outdoor writing will be supplied upon request. This sequence combines courses in journalism, wildlife, range management, conservation and other natural resources. Students may take major work in zoology and entomology, forestry, or technical journalism with minor work in the other fields.

Engineering students may elect a sequence of courses in technical journalism. Selection from the following courses is recommended: T.J.I. 221, 225, 325, 335, 341 or 342, 351, 475; Sp. 301. Because of the desirability of combining a sequence of courses with work on student publications, it is recommended that interested students begin their journalism work in the sophomore year where possible.
Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in technical journalism; and minor work to students taking major work in other departments.

To qualify for major work a student must have completed a curriculum leading to a Bachelor of Science degree, including a minimum of 12 hours of journalism, or an undergraduate curriculum in journalism substantially equivalent to that offered at this institution.

Open to graduate students for minor only: 430, 431, 445, 446, 465, 475.

Courses Primarily for Undergraduate Students


111. Journalistic Vocations. (2-0) Or. 2. S. Survey of opportunities in technical journalism.

221, 222. Technical Reporting. (2-3 to 12) Or. 1 to 6 each. Prerequisite: Engl. 103. Some proficiency in typing.

228. Business and Telephone Advertising. (2-8) Or. 8. For those not majoring in journalism.


310. Reporting Public Affairs. (2-3) Or. 3. F. Prerequisite: 222. Depth reporting as applied to public affairs.

317. News Photography. (2-6) Or. 4. 317, F.S. 318, W. Prerequisite: 221 or 225 or permission of Instructor. News camera and dark room techniques. Evaluation of news pictures; the picture story; lighting.

325. Technical Advertising. (3-0) Or. 3. F.S. Principles of advertising; planning, preparation, placing.

326. Radio and Television Advertising. (3-0) Or. 3. W. Prerequisite: 325, Sp. 301. Principles of advertising as applied to radio and television.

335. Feature Articles for Technical Journals. (3-0) Or. 3. W. Prerequisite: 225. For those not majoring in journalism.

341. Practice in Copy Editing and Typography. (2-3) Or. 8 each. F.W. Prerequisite: 222 or 225. Copy editing, headline writing and make-up. Type, type setting, and design of printed matter. Trips to graphic arts plants.

351. Magazine Production. (1-0) Or. 3. S. Prerequisite: Engl. 103. Workshop in editorial, advertising, and circulation management problems; publishing four monthly magazines as laboratory projects.

426, 427. Technical Writing. (2-3 to 9) Or. 1 to 5 each. F.W. Prerequisite: 222. Home economics students should have completed all required work in applied arts, child development, food and nutrition, household equipment and textiles and clothing. Gathering of material and preparation of articles for technical magazines.

430. Law of Communications. (3-0) Or. 3. F. Prerequisite: 225 or equivalent. The ethical, slander, copyright; postal laws; the Federal Communications Act; laws affecting advertising and legal publication.


445, 446. Technical Advertising. (3-0) Or. 3 each. W.S. Prerequisite: 225. Fundamentals in layout and copywriting. Selling and servicing for advertising media.

464. Community Newspaper. (3-0) Or. 3. Alt. S. Not offered 1958 Prerequisite: 222 or equivalent. Editorial, advertising, circulation, and management problems of rural community newspaper.


475. Informatve Writing for Radio and Television. (3-0) Or. 3. W. Prerequisite: 225 or equivalent, Sp. 302. Writing and planning continuity, talks, interviews, demonstrations, forums and discussions; documentary programs for radio and television.

476. Motion Picture Techniques. (2-3) Or. 3. S. Prerequisite: 481, 475 or Engl. 315. Basic techniques in taking, editing and presenting motion pictures as a means of communication with special stress on the requirements for television.

481, 482, 483. Radio and Television News. (1-6) Or. 8 each. F.W.S. Prerequisite: 225. Sp. 302. Writing and editing news for broadcasting.

482. Patterns and techniques for radio. News program building.

490. Special Problems in Communications. Or. 1 to 5. Prerequisite: Junior classification.
TEXTILES AND CLOTHING

Courses for Advanced Undergraduate and Graduate Students

510. Reader and Audience Analysis. (3-0) Cr. 3. SS. Prerequisite: 222 or 475. Reader interest surveys, application of understandability formulas, public opinion polls. Measuring influence.

515. Public Relations. (3-0) Cr. 3. S. Prerequisite: 225. Utilization of various media of public information for promotion of specific objectives.

517. Pictorial Communication. (2-3 to 9) Cr. 1 to 5. F. Prerequisite: 222, 317. A survey of the use in communication of photographs, drawings, graphs, charts, maps and non-word symbols. Special emphasis on how to communicate by means of pictures.

526, 527. Technical Writing. (2-3 to 9) Cr. 1 to 5 each. F.W. Prerequisite: 222. Gathering of material and preparation of articles for technical magazines.

Courses for Graduate Students


690. Research. Mr. Marvin.

TEXTILES AND CLOTHING

MARGARET C. WARNING, Ph.D., Head of Department

PROFESSOR: Fannie Potgieter, M.A.


ASSISTANT PROFESSORS: Lillian E. Brehm, M.A.; Winona F. Koch, M.S.; Harriet W. Lewis, M.S.

INSTRUCTORS: Winona N. Brooks, M.S.; Belva L. Covey, B.A.; Agatha L. Huepenbecker, M.S.; Harriet LaGrange, B.S.; Anita Rice, M.S.; Shirley-Jean Smith, M.S.

Opportunities for Undergraduate Study

For undergraduate curricula in textiles and clothing and in textiles and related science leading to the degree of Bachelor of Science, see pages 88 and 92.

Advanced work is also offered to provide fundamental information and training in textiles and clothing for those who wish to go into merchandising or other commercial positions which involve work in textiles, clothing, costume design, or fashion.

The curriculum in textiles and related science is designed for those who wish to prepare to work in textile laboratories or to do research in textiles.

The department also offers courses designed to furnish such knowledge and training as are essential to the consumer for satisfactorily providing clothing and household fabrics for the individual, the family, and the home.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of courses in applied art, chemistry (including inorganic and organic), economics, physics, textiles and clothing (including specific courses in general textiles, clothing construction and costume designing). Additional prerequisites may be required, depending upon the nature of the work the student wishes to pursue.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

Open to graduate students, for minor only: 404, 414, 424, 444, 454, 464, 466.
Courses Primarily for Undergraduate Students

145. Costume Selection. (3-4) Cr. 4. F.W.S.
Essentials of color, texture and design for clothing selection considering becomingness to individuals and suitability to environment.

204. Textiles. (2-4) Cr. 3. F.W.S.
Prerequisite: Chem. 105 or 101. Fundamental weaves, yarns, fibers, color and finishes with reference to selection of fabrics for clothing and house.

224. Elementary Clothing Construction. (1-6) Cr. 3. F.W.S.
Prerequisite: 145 and placement test. Use of commercial pattern, basic garment construction; fabrics in relation to pattern designs; construction for specific fabrics and designs. Students will be sectioned according to ability as indicated in a pretest in sewing skills.

324. Flat Pattern Designing. (2-6) Cr. 4. F.W.S.
Prerequisite: 224. Development of foundation pattern; flat pattern designing; making patterns for selected dress design and developing in wool-like fabric.

326. Children's Clothing. (3-3) Cr. 3. W.S.
Prerequisite: 224. Patterns, selection, and construction of suitable clothing for children.

404. Advanced Textiles. (3-9) Cr. 3. F.S.
Prerequisite: 204, Chem. 264. New developments in the textile field as reported in current literature.

414. Historical Textiles. (3-0) Cr. 3. W.S.
Prerequisite: 204, Hist. 213. Development of textiles from ancient times; existing sources; comparison with modern commercial products.

Courses for Advanced Undergraduate and Graduate Students

526. Advanced Applied Dress Design. (2-6) Cr. 3. S.
Designs and construction techniques suitable for various materials and garments.

527. Tailoring. (2-6) Cr. 4. F.W.S.
Prerequisite: 324. Tailoring construction applied in making coats and suits.

544. Advanced Costume Design. (2-4) Cr. 3. W.
Prerequisite: 444, A.A. 212.

Courses for Graduate Students

610. Seminar. Cr. as arranged. W.

614. Research. Misses Selects, Warning

THEORETICAL AND APPLIED MECHANICS

GLENN MURPHY, Ph.D., C.E., Head of Department


ASSOCIATE PROFESSORS: Alfred H. Hausrath, III, Ph.D.; Aldor C. Peterson, M.S.; Robert E. Uhrig, Ph.D.

ASSISTANT PROFESSORS: Elmer L. Munger, Ph.D.; Wilbur B. Ratterree, M.S.; Donald F. Young, Ph.D.

INSTRUCTORS: John M. Hanson, B.S.; Roger S. Hanson, M.S.; John K. Imig, B.S.; Connayll M. Jacob, M.S.; Michael A. McCoy, M.S.; Richard O'Regan, B.S.; Leonard D. Peterson, B.S.; Donald S. Sasscer, B.S.; Cletus E. Schertz, B.S.
Opportunities for 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 which influence the manner and extent of their use for engineering purposes. He is expected to acquire an understanding of the principles underlying the technique of analysis and a knowledge of those properties of materials which influence the manner and extent of their use for engineering purposes. He is 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 suitable for use in the solution of specific problems and structural design and in the flow and measurement of fluids.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in theoretical and applied mechanics; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution. This should include the undergraduate courses necessary for the particular field chosen. As philosophy in theoretical and applied mechanics; and minor work to students taking major work in other departments.

Courses for Advanced Undergraduate and Graduate Students

Courses for Advanced Undergraduate and Graduate Students

500. Special Topics. Or. 2 to 6 each time elected. As arranged. Messrs. Chamberlin, Gilkey, Murphy

506. Advanced Properties of Engineering Materials. (3-0) Or. 3. W.
Prerequisite: Phys. 213, Math. 314. Messrs. Chamberlin, Murphy
Influence of structure and environment on the mechanical properties of engineering materials. Types of imperfections and their effects. Control of properties.

514. Advanced Mechanics of Materials. (3 or 4-0) Or. 3 or 4. F.
Prerequisite: 324. Messrs. Chamberlin, Gilkey, Murphy.
Special problems met in engineering. Limitations of flexure and torsion formulas, unsymmetrical bending, curved beams, combined stresses, theories of
COLLEGIATE INSTRUCTION

Courses for Graduate Students

600. Research. Messrs. Chamberlin, Gilkey, Murphy

614. Analytical Study of Experimental Work in Concrete. (2 to 4-0) Or. 2 to 4. As arranged. Prerequisite: 387, C.E. 385. Mr. Gilkey

620. Seminar. (1-0) Or. 1. Messrs. Chamberlin, Gilkey, Murphy


624. Advanced Technical Statics. (3 or 4-0) Or. 3 or 4. W. Prerequisite: 824. Mr. Murphy

Prerequisite: 824. Mr. Murphy

640. Analysis of Dynamic Systems. (8-2) Or. 4. Prerequisite: 844, Math. 314. Mr. Murphy

644. Mechanical Vibrations. (3-2) Or. 4. W. Prerequisite: 844, Math. 314. Mr. Murphy

684, 685, 686. Similitude in Engineering. (2-2) Or. 3 each. Yr. 684. Prerequisite: 324 and permission of instructor. Mr. Murphy 685. Prerequisite: 378, 684. 686. Prerequisite: 684. 685. Use of models as aids to engineering design. Principles of dimensional analysis. Design and testing of models; interpretation of data. Application to beams and shafts under static and dynamic loading. (685) Application to problems of fluid flow. Hydraulic structures under various conditions of operation. Distorted models. (686) Analogies

VETERINARY ANATOMY

ROBERT GETTY, D.V.M., Ph.D., Head of Department

ASSOCIATE PROFESSOR: George C. Christensen, D.V.M., Ph.D.


Opportunities for Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see page 104.

Through courses in this department, veterinary students acquire a detailed knowledge of the anatomy of the domestic animals which is necessary for a proper understanding of physiology, pathology, diagnosis, surgery, and medicine.
Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in microscopic and gross anatomy; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that in veterinary medicine.

Courses Primarily for Undergraduate Students

101, 102, 103 Microscopic Anatomy. F.W.S.
101. (2-9) Cr. 5.
Prerequisite: One year of college biology.
102. (8-5) Cr. 5.
Prerequisite: 101.
103. (1-12) Cr. 5.
Prerequisite: 102.

Cells, tissues, organs, histogenesis, embryology, organogenesis, and structure.

111, 112, 113 Gross Anatomy. F.W.S.
111. (1-14) Or. 6.
Prerequisite: One year of college biology.
112. (0-18) Or. 6.
Prerequisite: 111.
113. (0-15) Or. 6.
Prerequisite: 112.

Systematic and topographic study and dissection of horse, ox, sheep, pig, dog, chicken, and laboratory animals.

217 Anatomy of Domestic Animals.
(3-9) Or. 3. F.

For students in agriculture and others desiring fundamental knowledge of anatomy.

401. Advanced Anatomy.
(0-9) Cr. 3 to 5 each time taken. F.W.S.
Prerequisite: 101, 112 and permission of instructor.
A. Regional systematic and topographic dissection of clinical, surgical and obstetrical areas as related to practice of veterinary medicine.
B. Microscopic anatomy and its techniques as applied to organs and systems.

402. Applied Anatomy. (2-8) Or. 3. F.
Prerequisite: Fourth year classification in Vet. Med.
Principal surgical neurological and obstetrical anatomical subject matter and its clinical application.

Courses for Advanced Undergraduate and Graduate Students

(1-6 or 12) Or. 3 or 5 each time taken.
Yr.
Prerequisite: One year of college biology and permission of instructor. Mr. Getty
Dissection of dog, chicken and other animals.

511. Neuroanatomy.
(2-8 or 2-0) Or. 2 or 4. Alt. W. Offered 1958
Prerequisite: Permission of instructor. Mr. Getty
Central and peripheral nervous system including the organs of special sense.

Courses for Graduate Students

601, 602, 603. Advanced Microscopic Anatomy.
601. (2-9) Or. 5; 602. (3-5) Or. 5;
603. (1-12) Or. 5. F.W.S.
Prerequisite: One year of college biology. Mr. Getty

Otology, embryology, and microscopic organology of the animal body.

604. Seminar. Or. 1. Yr.
Mr. Getty

Endocrinology. (V.Phys. 668, A.H. 668)
(3-8) Or. 4. Alt. B. Not offered 1958
Prerequisite: Permission of instructor. Messrs. Getty, Hewitt, Melampy
Embryology, structure and function of endocrine organs.

Research.
A. Gross Anatomy. Mr. Getty
B. Microscopic Anatomy. Mr. Getty

VETERINARY MEDICAL CLINICS

See page 253.

VETERINARY HYGIENE

R. ALLEN PACKER, D.V.M., Ph.D., Head of Department


ASSOCIATE PROFESSOR: William P. Switzer, D.V.M., Ph.D.

ASSISTANT PROFESSOR: Wayne W. Kirkham, D.V.M., M.S.


Opportunities for Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see page 104.

The Veterinary Hygiene Department offers instruction in bacteriology, virology, im-
munology, food hygiene, and in the diagnosis and control of the infectious diseases. The department cooperates in the sanitary control of the milk supply to the city of Ames which furnishes a teaching laboratory in the course in dairy hygiene.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in veterinary bacteriology and veterinary hygiene; major work for the degree of Doctor of Philosophy in veterinary bacteriology; and minor work to students taking major work in other departments.

The laboratory facilities of the Veterinary Medical Research Institute are available to approved and qualified students.

Prerequisite to major graduate work is the possession of the D.V.M. degree or the completion of an undergraduate curriculum substantially equivalent to that in veterinary medicine.

Courses Primarily for Undergraduate Students

224. General Bacteriology and Immunology. (3-9) Or. 1, P. 
Prerequisite: Chem. 874, 875 or equivalent.
Morphology, classification, and physiological characteristics of pathogenic bacteria; principles of infection and immunity.

225. Pathogenic Bacteriology. (3-6) Or. 5, W. 
Prerequisite: 224, V.Path. 254.
Detailed study of bacteria associated with animal diseases.

226. Virology. (3-3) Or. 4, S. 
Prerequisite: 225, V.Path. 254, 255.
The general properties of viruses and characteristics of virus diseases of animals.

420. Dairy Hygiene. (2-6) Or. 4, P.W.S. 
Prerequisite: First 3 years of veterinary curriculum.
Study of effect of bovine diseases and sanitation on safety and quality of milk and milk products.

421, 422, 423. Infectious Diseases. F.W.S. 
421, 422. (4-6) Or. 4 each. 423, (4-8) Or. 5.

Courses for Advanced Undergraduate and Graduate Students

529. Immunology. (3-0 or 6) Or. 3 or 5. S. 
Prerequisite: 224, 225, V.Path. 255, 256.
Mr. Packer
Detailed study of immunity and use of immunizing products in controlling animal diseases.

590. Special Topics. Cr. 1 to 5. F.W.S. 
Prerequisite: 225. Messrs. Hofstad, Packer

Courses for Graduate Students

604. Seminar. (1-0) Cr. 1. F.W.S. 
Mr. Packer

625. Pathogenic Bacteriology. (3-6) Or. S. W. 
Prerequisite: 224, 225. Mr. Packer
Pathogenic bacteria and the relationship of their metabolism to animal diseases.

626. Virology. (3-3) Or. 4. S. 
Prerequisite: 225. V.Path. 255. Mr. Packer
General characteristics of viruses, technical procedures and specific viruses causing disease in animals.

690. Research. 
A. General and Food Hygiene. 
Mr. Packer
B. Pathogenic Bacteriology. 
Messrs. Hofstad, Packer

VETERINARY MEDICINE AND SURGERY

BURNELL W. KINGREY, D.V.M., M.S., Head of Department

PROFESSORS: Clarence H. Covault, D.V.M.; George R. Fowler, B.S., D.V.M.; Maurice J. Johnson, D.V.M.


Opportunities for Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see page 104.

The study of medicine and surgery summarizes and shows the application in practice of the training previously received in anatomy, physiology, pathology, and therapeutics. On completion of the senior year the student has not only the theoretical knowledge, but some of the more practical methods of applying such knowledge. The transition from the student to the practitioner presents little difficulty after such training.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in veterinary medicine and surgery, and minor work to students taking major work in other departments.

The laboratory facilities of the Veterinary Medical Research Institute are available to approved and qualified students.

Prerequisite to major graduate work is graduation from an approved college of veterinary medicine.

Courses Primarily for Undergraduate Students

331, 382, 388. Large Animal Medicine. (5-0) Cr. 5 each. F.W.S.
Prerequisite: First two years of the veterinary curriculum.

332. Prerequisite: 331.

Methods employed in diagnosis of animal diseases and consideration of diseases not caused by infectious agents.

336. Small Animal Medicine. (6-0) Cr. 5. W.
Prerequisite: 331.

Treatment and prevention of diseases of small domestic and furbearing animals and pet birds.

337. Small Animal Surgery. (5-0) Cr. 5.
Prerequisite: 331.

Surgical diseases of small domestic and furbearing animals and pet birds.

387. Surgery. (5-0) Cr. 5.
Prerequisite: First two years of veterinary curriculum.

Fundamental principles.


438. Professional Orientation. (2-0) Cr. 2.
Prerequisite: Fourth year classification in V. Med.

Professional ethics and other problems of the professional man.

481, 482, 483. Clinics. Yr. (0-18) Total Cr. 8 each, including and concurrent with Y. Obst. and Rad. 481, 492, 489.

484. Applied Medicine and Surgery. (5-6) Cr. 4. F.W.S.
Prerequisite: First three years of veterinary curriculum.

Special study of problems in diagnosis and treatment of selected cases and a special surgical laboratory.

VETERINARY OBSTETRICS AND RADIOLOGY

Mack A. Emmerson, D.V.M., M.S., Dr.Med.vet., Head of Department

Professor: John B. Herrick, D.V.M., M.S.

Assistant Professor: James E. Lovell, D.V.M., M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see page 104.

Courses in Obstetrics

The department presents the course work in obstetrics in three categories: (a) Interferences with parturition both fetal and maternal; (b) diseases of the newborn, from
birth to several days of age. Special emphasis is placed on the etiology, treatment and prevention of such interferences with animal reproduction; (c) interferences with normal reproduction, commonly called "sterility".

Courses in Radiology

The importance of radiology as a diagnostic aid and a therapeutic measure in the handling of animal disease is rapidly becoming more important. More veterinarians are adding X-ray apparatus to their therapeutic equipment. The department presents a systematically organized course in radiology emphasizing the handling, taking, processing and interpretation of skiagrams, and the dangers of X-rays to man and animal when improperly used.

Opportunities for Graduate Study

The department offers major work for the degree of Master of Science in veterinary obstetrics with special emphasis on the diseases of reproduction of domestic animals. While advanced degrees are not offered in radiology this very valuable and relatively new approach to the study of reproductive disturbances is available to graduate students in obstetrics.

Courses Primarily for Undergraduate Students

(4-3 Or. 5 F.)
Prequisite: First six quarters of veterinary curriculum.
Care of pregnant animals. Causes and treatment of difficult parturition. Care of newborn during first two weeks of life.
381, 382, 383. Clinics. (0-12) Required. Yr. 
440. Radiology. (3-0) Or. A. W. 
Prequisite: First ten quarters of the veterinary curriculum.

Courses for Graduate Students

604. Seminar. Or. 1. F.W.S. 
Mr. Emmerson
(2-3 or 9) Or. 3 or 5 P.W.S. 
Prequisite: 444. Mr. Emmerson
645. Advanced Obstetrics. 
(2-3 or 9) Or. 3 or 5 P.W.S. 
Prequisite: 444. Mr. Emmerson

VETERINARY PATHOLOGY

FRANK K. RAMSEY, D.V.M., Ph.D., Head of Department


Opportunities for Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see page 104.

The Department of Veterinary Pathology offers a systematic study of the causes of disease and the manner in which these causes bring about alterations in the anatomical structure and chemical and physiological activities of animal cells, tissues, organs, and
systems of organs. The application of these studies makes diagnosis more accurate and forms a foundation for the control of livestock diseases.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in veterinary pathology; and minor work to students taking major work in other departments.

The laboratory facilities of the Veterinary Medical Research Institute are available to qualified and approved students.

Prerequisite to major graduate work is the completion of an undergraduate curriculum leading to the degree of Doctor of Veterinary Medicine.

Minor work is recommended in bacteriology, veterinary hygiene, chemistry, zoology, entomology, physics, botany, or genetics.

Courses Primarily for Undergraduate Students

254, 255. General Pathology. F.W.
254. (3-0) Or. 3; 255. (2-6) Or. 4.
254. Prerequisite: V.Anat. 103, 113.
255. Prerequisite: 254. V.Anat. 103, 113; V.Hyg. 224, V.Phys. 164.
Causes and effects of disease applying to the body as a whole.

256. Special Pathology. (5-6) Or. 7. S.
Prerequisite: 255.
Etiology, pathogenesis, lesions, and termination of disease in organs or systems of organs in specific infectious diseases.

257, 258. Veterinary Parasitology. W.S.
257. (3-2) Or. 4.
Prerequisite: 255.

Courses for Graduate Students

604. Seminar. Or. 1.) F.W.S. Mr. Ramsey
651, 652. General Pathology. F.W.
651. (3-0) Or. 3. Mr. Monlux
Prerequisite: V.Anat. 103, 113.
652. (2-6) Or. 4.
Prerequisite: 651. V.Hyg. 225; V.Phys. 266.
Fundamentals of disease with emphasis on disease in animals.

653. Special Pathology. (5-6) Or. 7. S.
Prerequisite: 652. Mr. Ramsey
General pathologic fundamentals applying to organs or systems of organs and to specific infectious diseases of animals.

656. Advanced Veterinary Pathology. (1-3 to 12) Or. 2 to 6. F.W.S.
Prerequisite: 255 or 653. Messrs. Benbrook, Biester, Monlux, Ramsey, Schwarte
Introduction to research in animal disease.

657, 658. Veterinary Parasitology. W.S.
657. (8-3) Or. 4. Mr. Benbrook
Prerequisite: 657.
Parasites and parasitic diseases of animals and the principles of their control.

658. (8-3) Or. 4.
Prerequisite: 657.
Problems of parasitism in relation to animals.

659. Advanced Veterinary Parasitology. (1-3 to 12) Or. 2 to 6. F.W.S.
Prerequisite: 256, 258 or 658. Messrs. Benbrook, Biester
Introduction to research in animal parasitology.

900. Research.
A. Veterinary Pathology. Messrs. Benbrook, Biester, Monlux, Ramsey, Schwarte
B. Veterinary Parasitology. Messrs. Benbrook, Biester

VETERINARY PHYSIOLOGY AND PHARMACOLOGY

MELVIN J. SWENSON, D.V.M., Ph.D., Head of Department


ASSOCIATE PROFESSOR: Joseph G. Graça, Ph.D.

Opportunities for Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree of Doctor of Veterinary Medicine, see page 104.

Before acquiring a proper concept of disease it is necessary to understand the normal function of the body structures. In the courses in physiology the students make a detailed study of the normal functions and activities of the cells, tissues, organs, and systems constituting the animal body.
Pharmacology in its broad sense is the science that investigates drugs, and for convenience of study is often subdivided into pharmacognosy, pharmacy, pharmacodynamics, and toxicology. Each of these is given proper consideration in the courses in pharmacology, with special emphasis on drugs and therapeutic practices important in veterinary medicine.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in veterinary physiology, and minor work to students taking major work in other departments.

The laboratory facilities of the Veterinary Medical Research Institute are available to approved and qualified students.

Students expecting to do major work should have fundamental knowledge of physiology, zoology, anatomy, histology and chemistry. The exact requirements will depend upon the field of work the student expects to pursue.

Open to graduate students for minor only: 366.

Courses Primarily for Undergraduate Students

164. Comparative Mammalian Physiology. (5-8) Cr. 6. S.
Prerequisite: V.Anat. 102, 112.
Physiology of the nervous system, special senses, muscular system and circulating fluids of the body.

204. Physiology of Domestic Animals. (8-0) Cr. 3. W.
Prerequisite: V.Anat. 217.
For agriculture students. Systematic survey of physiologic processes in domestic animals.

266. Comparative Mammalian Physiology. (5-8) Cr. 6, F.W.
Prerequisite: V.Anat. 502, Mr. Swenson.
Especially adapted for graduate students as minor work in fields of animal, dairy or poultry husbandry; in biological sciences, chemistry and home economics. Physiology of the nervous system, special senses, muscle and circulating fluids of the body.

267. General Pharmacology. (4-0) Cr. 4. S
Prerequisite: 266.
Pharmaceutical principles and processes; metrology; prescription writing; general properties; classification, administration and introduction of drugs.

364. Physiology of Domestic Fowls. (8-0) Cr. 8, Alt. W. Offered 1958
Prerequisite: 264 or equivalent.

366. Pharmacology and Therapeutics. Cr. 4 each. F.W.
867. (4-0) 868. (3-3).
Prerequisite: 266, 267.
Drugs important in veterinary medicine, including pharmacology, administration, metabolism, pharmacodynamics and therapeutic action.

485. Animal Nutrition. (3-0) Cr. 3. W.
Prerequisite: Fourth year classification in veterinary medicine.
Practical applications of animal nutrition and remedial procedures for veterinary students.

Courses for Graduate Students

604. Seminar. Cr. 1. F.W.S.
Prerequisite: V. Anat. 502, Mr. Swenson.

661. Comparative Mammalian Physiology. (3-0 or 4-3) Cr. 3 or 5. S.
Prerequisite: V. Anat. 502, Mr. Swenson.
 Especially adapted for graduate students as minor work in fields of animal, dairy or poultry husbandry; in biological sciences, chemistry and home economics.

662. Comparative Mammalian Physiology. (3-0 or 4-3) Cr. 3 or 5. F; 663. (3-0 or 4-3) Cr. 3 or 5. W.
Prerequisite: V. Anat. 502, Mr. Swenson.
Continuation of 661. Physiology of the organs of circulation, respiration, digestion, urinary system, animal heat, endocrine organs and reproduction.

667. Advanced Physiology. (3-0 or 2-0) Cr. 1 or 3. F.W.S.
Prerequisite: 668. Mr. Swenson.
Methods of approach to the specific phase of physiological research in which the individual is interested.

Prerequisite: Permission of instructor.
Mesara. Getty, Melampy, Swenson
Embryology, structure and function of endocrine organs.

690. Research. Physiologv. Mr. Swenson

VOCATIONAL EDUCATION

RAY J. BRYAN, Ph.D., Head of Department


ASSOCIATE PROFESSORS: Clarence E. Bundy, M.S.; Durwin M. Hanson, Ph.D.; Glen Holmes, M.A.; O. Steve Knudsen, M.A.; Virgil S. Lagomarcino, Ph.D.


INSTRUCTORS: Duane L. Blake, M.S.; Duane M. Nielsen, M.S.
Opportunities for Undergraduate Study

For undergraduate curricula in agricultural education and in industrial education leading to the degree of Bachelor of Science, see pages 41 and 54.

Professional courses for teachers are offered at the Iowa State College by the Departments of Vocational Education, Home Economics Education, Psychology, and the Division of Science. These are designed especially to prepare teachers for the following fields: vocational and general agriculture, vocational home economics, industrial arts, trades and industry, art, biology, chemistry, physics, general science, English, history, social studies, mathematics and physical education.

Students majoring in the several fields of education meet the requirements for the Professional Certificate in Iowa and similar certificates in most other states.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science, Master of Vocational Education and Doctor of Philosophy in vocational education, and minor work to students taking major work in other departments. The following fields in which research is being carried on by the department are appropriate for research by graduate students: agricultural education, industrial education, rural education, and vocational guidance.

Prerequisite to major graduate work in vocational education is preparation substantially equivalent to the completion of one of the undergraduate curricula in education offered at Iowa State College and adequate proof that the student ranks above average in scholastic ability and promise of vocational competency. Students should not complete plans for enrollment in the Graduate College with a view of becoming candidates for the degree of Doctor of Philosophy in vocational education without the approval of the head of the department.

Open to graduate students for minor only: 415, 426, 466, 467.

Professional Courses in Other Departments

Home Economics Education. H.Ed. 405, 406, 407, 408, 409, 504, 605, 606, 607, 608, 609, 610, 612, 614. (For course descriptions, see page 183.)

Physical Education (men). Phys.Ed. for Men 318, 411, 412, 413, 491, 492, 493, 494. (For course descriptions, see page 213.)

Physical Education (women). Phys.Ed. for Women 326, 330, 336, 338, V.Ed. 590H. (For course descriptions, see pages 214 and 215.)

Psychology. Psych. 104, 234, 334, 340, 434, 515, 520, 534, 538, 555, 624. (For course descriptions, see pages 220, 221 and 222.)

Sciences: Art—A.A. 400H; English—Engl. 394; Mathematics—Math. 497; Sciences—Sci. 486; Social studies—Sci. 496; Student teaching—Sci. 417.

Teacher Certification

The Iowa Professional Certificate will be issued to a person who holds a diploma from an accredited Iowa college certifying the completion of a four-year course; who has taken a minimum of 30 credits (20 semester hours) in one academic field with 22⅔ credits (15 semester hours) in each of two additional fields or 45 credits (30 semester hours) in one subject matter field and 30 credits (20 semester hours) in one additional field; who has taken 3 credits in principles of American government or American history and who has taken a minimum of 30 credits (20 semester hours) in professional education distributed as follows:

(a) Methods of teaching and evaluating pupil progress (6 semester hours) 9 credits.
(b) Supervised student teaching at least (5 semester hours) 7½ credits.
(c) Professional education required of all candidates for teacher's certification.

Candidates for certificates to teach must take V.Ed. 305 for 4 credits.

The permanent professional certificate will be issued to a person who has met the requirements for a Professional certificate, who has earned 30 semester hours of graduate credit and who has four year's successful teaching experience.
Approval to teach Driver Education and Safety requires 15 credits in the field of safety education, including 3 credits in actual behind-the-wheel driving. These credits are to be distributed as follows:

(a) Psychology 174 (3 cr.), 370 (3 cr.), and 372 (3 cr.) are required.
(b) The 6 additional hours may be elected from Psychology 320 (1 to 3 cr.), 474 (3 cr.), 370 (3 cr.), 520 (1 to 3 cr.), or 574 (1 cr.).
(c) Certain elective courses specifically dealing with safety may be added from various other curricula. Write to Driving Research Laboratory for details.

Persons interested in types of certificates not described above, or who wish to know what courses meet the specific requirements of any certificate, should communicate with the head of the Department of Vocational Education or write to the Department of Public Instruction, Des Moines, Iowa.

Teacher Placement

A Teacher Placement Office is maintained for those who are interested in educational positions. The services of this office are available to anyone who has been registered as a resident student of Iowa State College. These services are extended gratuitously to both candidate and employer, except for an annual registration fee of $3 to cover, in part, the cost of postage and the preparing of credentials. Requests for information should be addressed to the Teacher Placement Office, 327 Curtiss Hall, Iowa State College, Ames, Iowa.

Courses in General Vocational Education

Courses Primarily for Undergraduate Students

204. Principles of Education. (3-0) Cr. 3. F.W.S.
Place of education in democracy; American public school system; modern objectives of education; legal, personal and professional qualifications for teaching.

305. Methods of Teaching. (3-0 or 2) Cr. 3 or 4. F.W.S.
Prerequisite: 204 or classification in Psych. 534 and quality point average 2.1. Junior classification.
Methods of realizing such teaching objectives as interests, ideals, understandings and abilities. Special emphasis on problem, project and unit teaching evaluation, and audio-visual aids.


426. Principles of Secondary Education. (3-0) Cr. 3. F.W.S.

Courses for Advanced Undergraduate and Graduate Students

539. Counselling High School Students. (2-2) Cr. 3. S.
Prerequisite: 15 credits in education. Mr. Bryan
Basic principles and techniques of counseling in vocational, educational, and personal guidance, with emphasis on analysis of pupil problems.

554. Administration of the Guidance Program. (3-0) Cr. 3. W.
Prerequisite: 15 credits in education. Mr. Bryan
Principles and practices in aiding students to make educational and vocational adjustments: occupational studies; testing and records; group guidance and follow-up.

555. Evaluation of Educational Outcomes. (2-0) Cr. 2. S.
Prerequisite: 15 credits in education or permission of instructor. Mr. Wert
Methods of evaluating educational outcomes; types of tests and their construction; use and interpretation of educational measures in teaching.

536. Adult Education. (1 or 2-0) Cr. 2 or 3. F.
Prerequisite: 15 credits in education or permission of the head of the department. Messrs. McClelland, Seaxauer
Survey of current trends and current activities in adult education. Special problems and practices in organizing adult education programs. Observation and evaluation of the community program of adult education.

550. Audio-Visual Methods in Education. (2-3) Cr. 3. W.
Prerequisite: 305. Mr. Litherland
Sources, selection, preparation and use of audio-visual instruction materials. Relation of scientific studies.

551. Occupational Information. (3-0) Cr. 3. F.
Prerequisite: 15 credits in psychology and education. Mr. Bryan
552, 553. Educational Statistics. (3-0) Or. 3 each. F.W.
Prerequisite: 15 credits in education. Mr. Wert
Statistical concepts and procedures for teachers, school administrators, and research workers.

561. Methods of College Teaching. (2 or 3-0) Or. 2 or 3. S.
Prerequisite: Permission of instructor. Mr. Friley
Basic principles of educational methods; abilities essential to effective teaching.

584. History of Education. (3-0) Or. 3. W.
Prerequisite: 15 credits in education. Mr. Morgan
Historical foundations of education in Europe and the United States of America.

590. Special Topics. Or. 1 to 5. F.W.S.
Prerequisite: 15 credits in education and permission of instructor.
A. Agricultural Education. Messrs. McClelland, Sexauer
B. Adult Education. Messrs. McClelland, Sexauer
C. Rural Secondary Education. Messrs. Bryan, Wert
D. Vocational and Educational Guidance. Mr. Bryan

Courses for Graduate Students

602. Current Educational Movements. (2 or 3-0) Or. 2 or 3. W.
Survey of current philosophies and movements in education.

615. Seminar. (0-1 to 3-0) Or. 1. F.W.S.
Messrs. Morgan, Wert

624. Research Methods in Education. (2-0) Or. 2. S. Mr. Wert
Adaptation of research techniques to problems in education. Primarily for students preparing to write theses.

Courses in Agricultural Education

Courses Primarily for Undergraduate Students

110. Freshman Problems. (1-0) Required. F.
Opportunities in education; qualifications; personal development; how to study. Required for freshmen majoring in vocational education.

211. Observation and Survey of Programs of Education in Agriculture. (0-3) Or. 1. F.E. F. S. of S.
A. Agricultural Education. (0-3) Or. 1. F.E. F. S. of S.
Survey of high school departments of agriculture. Survey of day school, young adult farmer programs. Field trips.
B. Extension Education. (0-3) Or. 1. F.S.
Visit of central staff departments, county programs and special day activities; observation and discussion of extension education programs in agriculture and home economics. Field trips.

321. Planning and Evaluating the Program in Vocational Agriculture. (2-3) Or. 3. F.W.S.
Prerequisite: Organization, methods and evaluation of the program in vocational agriculture. Departments are visited to observe programs and results.

415. Teaching Farm Mechanics. (A.E. 415) (2-3) Or. 3. F.W.S.
Prerequisite: A.E. 254 or permission of instructor.

E. Administration of Rural and Vocational Education. Messrs. Bryan, Morgan
F. Supervision of Rural and Vocational Education. Messrs. Bryan, Morgan, Sexauer
G. Techniques of Research in Education. Mr. Wert
H. Administration and Supervision of Physical Education. J. Science Education. K. Classroom Utilization of Audio-Visual Aids, including Radio and Television. Mr. Litherland

591. Supervised Field Experience. (0-3 to 9) Or. 1 to 3. F.W.S.
Prerequisite: 15 credits in graduate work in special area or permission of instructor.
Supervised on-the-job field experience in special areas.

593. Workshop. Or. 1 to 5. SS.
Prerequisite: 15 credits in education. Messrs. McClelland, Sexauer
A. Agricultural Education. Messrs. McClelland, Sexauer
B. Adult Education. Messrs. McClelland, Sexauer
C. Rural Secondary Education.
D. Vocational and Educational Guidance. Sexauer
E. Administration and Supervision of Rural and Vocational Education. Messrs. Morgan, Sexauer
F. Industrial Education.

684. College Organization and Administration. (3-0) Or. 3. F. Mr. Friley
Lectures and discussions relating to college and university administration for general information of graduate students expecting to enter teaching profession.

920. Research. F.W.S.
Messrs. Bryan, Lancelot, Litherland, McClelland, Morgan, Sexauer, Wert

Objectives and methods: equipment and management of shop; organization of shop programs. Students will plan and present demonstration of methods of teaching mechanical skills.

423. Methods of Teaching Vocational Agriculture in High School. (3-0) Or. 4. F.W.S.
Prerequisite: 321.
Course organization, methods, farming programs and Future Farmers of America activities. Departments are visited to observe programs and results.

424. Young Farmer and Adult Education in Agriculture. (0-3) Or. 4. F.W.S.
Prerequisite: 321.
Methods in organizing and teaching classes in vocational agriculture for young and adult farmers. Departments visited to determine best practices.

425. Observation and Supervised Teaching in Agriculture. Or. 3 to 12. F.W.S.
Prerequisite: 321.
Three to nine weeks of full-time observation and supervised teaching in public schools. To be scheduled with "as arranged" courses and special sections.
COLLEGIATE INSTRUCTION

466. Administration and Organization of Extension Education. (3-0) Cr. 3. F.W.
Prerequisite: Permission of instructor. History and philosophy of extension education in agriculture and home economics; plans of organization; extension program of relationships with other agencies; selection and training of extension personnel.

Courses for Advanced Undergraduate and Graduate Students

537. Methods of Teaching Adults. (1 or 2) Cr. 3. S.S.
Prerequisite: Either 426, 466, 467, or permission of head of department. Messrs. McClelland, Sexauer
Principles and practices; conducting forums; leading group discussions, using visual aids and teaching short unit courses. Observation of programs and methods.

Courses for Graduate Students

593A. Special Problems in Agricultural Education. F.W.S.
For description of course, see courses in General Vocational Education, page 240.

Courses in Home Economics Education

For description of courses, see Home Economics Education, page 183.

Courses in Industrial Education

Courses Primarily for Undergraduate Students

104. Ornamental Metalwork. (1-6) Cr. 3. W.
Use of non-ferrous metals in construction of useful projects, peening, twisting, forming, bending, riveting, spinning, etching, piercing and tooling.

105. Woodfinishing. (1-6) Cr. 3. F.
Finishing materials and techniques used in wood finishing, bleaching, filling, staining, varnishing, lacquering, novelty finishes and furniture refinishing.

106. Woodwork I. (1-6) Cr. 3. S.
Care and use of hand tools; basic tool operations and their application to woodworking.

107. Plastics and Crafts. (1-6) Cr. 3. S.
Craft materials and their application to industrial arts shopwork; principles and techniques of crafts suitable for industrial arts craft classes, such as plastics, leather, cementing, etc.

150. Introduction to Industrial Education. (3-0) Cr. 3. S.
Qualifications, opportunities, preparation and duties of workers in industrial arts, vocational industrial education and industry.

154. Drawing for Teachers of Agriculture. (0-6) Cr. 2. F.W.S.
Basic techniques and skills in drawing and their application to the problems of agricultural teachers.

205. Woodwork II. (1-6) Cr. 3. W.
Prerequisite: 105, 106
Basic principles and practices involved in the use of power woodworking machines and their application to furniture and cabinet making.

250. Industrial Arts Design. (3-0) Cr. 3. W.
Application of fundamental principles of design in planning of industrial arts projects. Field trips to industries, museums, etc.
Courses for Advanced Undergraduate and Graduate Students

510. Technique of Teaching Trades. (3-0) Cr. 3. SS. 
Prerequisite: Permission of instructor. 
Teaching processes, methods of presentation and testing, lesson planning; organization of instruction, etc., for trade preparation.

514. Foundation of Industrial Education. (3-0) Cr. 3. W. Alt. SS. Not offered 1958. 
Prerequisite: Permission of instructor. 

515. Teaching Industrial Education. (3-0) Cr. 3. W. Alt. SS. Offered 1958. 
Prerequisite: 415 or equivalent. Mr. Hippaka. 
Preparation for teaching industrial education in the secondary schools extended to college teaching in the fields of industrial arts education as well as vocational industrial education. Visitations to schools and industries.

518. Problems in Industrial Education. (3-0) Cr. 3. Alt. SS. Offered 1958. 
Prerequisite: Permission of instructor. 
Organization, administration and supervision of vocational-industrial programs in public schools.

519. Trade Analysis. (3-0) Cr. 3. Alt. SS. Offered 1958. 
Prerequisite: Permission of instructor. 
Basic types of analysis. Preparation of instruction sheet for teaching trade subjects.

524. Industrial Conference Methods. (3-0) Cr. 3. Alt. SS. Not offered 1958. 
Prerequisite: Industrial or industrial teaching experience. Use of conference methods in instruction. Study and practice of conference procedures, devices, and techniques.

525. Co-ordination of Part-time Industrial Education. (3-0) Cr. 3. W. Alt. SS. 
Prerequisite: Permission of instructor. 
Demand of supervisors, principals, teachers and co-ordinators working in part-time industrial schools for employed minors.

551. Industrial Occupations. (3-0) Cr. 3. S. Alt. SS. Not offered 1958. 
Prerequisite: 15 credits in education or psychology. Mr. Hippaka. 
Changing conditions in industry, employment opportunities and preparation of workers for industry; problems of employers and employees; industry, school, community relationships. Field trips to schools and industries.

555. Administration and Supervision of Industrial Education. (3-0) Cr. 3. F. Alt. SS. Offered 1958. 
Prerequisite: 415. Mr. Hippaka. 
Administration, supervision, curriculum development, selection of staff, and public relations. Evaluating administrative and supervisory efforts; program modification. Field trips to schools and industries.

590. Special Topics in Industrial Education. Cr. 1 to 5. F.W.S. 
Prerequisite: 15 credits in education. Mr. Hippaka. 
A. Industrial Arts. 
B. Trades and Industry.

593F. Workshop in Industrial Education. SS. 
For description of course, see General Vocational Education.

Courses for Graduate Students

652. Evaluation in Industrial Education. (2 or 3-0) Cr. 2 or 3. Alt. SS. Not offered 1958. Mr. Hippaka. 
Scoring of industrial education shops. Evaluating programs in industrial education. Developing testing program; interpretation and utilization of test scores; teacher rating.

656. Analysis and Organization of Instruction. (3-0) Cr. 3. S. Alt. SS. Offered 1958. Mr. Hippaka. 
Techniques for collecting, analyzing and organizing subject matter for instructional purposes; best methods and devices for presentation.

657. Curriculum Building in Industrial Education. (2-0) Cr. 3. F. Alt. SS. Not offered 1958. Mr. Hippaka. 
Basic considerations in curriculum construction. Staff organization in curriculum building. Departmental articulation of subject matter. Articulation of industrial education course content with other school subjects. Continuous curriculum modification.

690. Research. Mr. Hippaka
Courses in Rural School Administration

Courses for Advanced Undergraduate and Graduate Students

541. Introduction to Rural Education Administration. (2 to 4-0) Or. 2 to 4. F.S.S.

Prerequisite: 15 credits of education or permission of instructor.

Philosophy and purposes of education in a democratic society. Basic principles of school administration. Analysis of the nature and function of units of education at local, intermediate and state levels; principles and procedures for their organization; techniques for making surveys.

542. The Rural Community Program of Secondary Education. (2 or 3-0) Or. 2 or 3. S.S.

Prerequisite: 426 or equivalent.

The academic and vocational program of community high schools; extra-class activities; education programs for post-high school youth and adults; local community resources as curriculum content; curriculum revision.

543. The Administration of Rural School Personnel. (2 or 3-0) Or. 2 or 3. W.S.S.

Prerequisite: 15 credits in education.

Selection and organization of the teaching staff; personnel policies; stimulation of professional growth; management of non-professional employees; administration of pupil personnel services; nature of leadership; working with the board of education; public relations.

544. Administration of Material Facilities in Rural Education. (2 or 3-0) Or. 2 or 3. S. S.S.

Prerequisite: 15 credits in education.

Courses for Graduate Students

544. Financial Administration of Rural Education. (2 to 4) Or. 2 to 4. S.S.

Fiscal administration of local school systems; state and federal aid; units of administration and attendance.

576. Duties of Rural School Principals. (2 or 6-0) Or. 2 or S. S.S. Messrs. Bryan, Morgan

Prerequisite: 15 credits in education.

Elementary and secondary school organization, schedule making, management of pupil organizations, evaluation of pupil growth. Evaluation of the total program of the community school through surveys, check lists, scales and reports.

590. Research. F.W.S.

Messrs. Bryan, Lancelot, Morgan, Wert

ZOOLOGY AND ENTOMOLOGY

Halbert M. Harris, Ph.D., Head of Department


ASSOCIATE PROFESSORS: Robert E. Haupt, Ph.D.; Edwin T. Hibbs, Ph.D.; Ellis A. Hicks, Ph.D.; Jean L. Laffoon, Ph.D.; Earle S. Raun, Ph.D.; Walter C. Rothenbuhler, Ph.D., Martin J. Ulmer, Ph.D.


INSTRUCTORS: Jewett Dunham, M.S.; Marion Ferguson, M.S.; Victor C. Thompson, M.S.

Opportunities for Undergraduate Study

For undergraduate curriculum in science, major in zoology, leading to the degree of Bachelor of Science, see page 97.

Zoology majors find employment as wildlife and fishery biologists, entomologists, research aides, extension specialists, teachers and research workers and as technicians in industrial laboratories, hospitals and clinics.
The department offers courses which are fundamental to specialization in medicine and dentistry, agriculture, forestry, veterinary science and home economics, as well as in the various branches of biology. The curriculum in science, with major in zoology, is flexible and adaptable to the needs of the individual. Opportunity is given for each student to plan his program of courses so that emphasis is put on his own vocational objective. Especially strong training is offered in wildlife management, entomology, protozoology, physiology, embryology, fishery management, helminthology and apiculture.

Undergraduate majors in this department usually have included the following basic courses in their programs: 101, 102, or 104, 105; 224, 234, 274, 303, 324, 351, 407, 511, 512. As supporting work, undergraduate majors have found the following courses desirable: Gen. 300; Bot. 101, 205; Chem. 101, 102, 103, 334, 335; Psych. 104; Soc. 134; Math. 101, 102, 103, or 111, 112, 113; Geol. 200; Phys. 211, 212, 213; Bact. 304A; Ec. 241, 242. These courses are not to be regarded as fixed requirements or as complete outlines of the work necessary for the major. They are given here solely for the convenience of the students or advisers who wish to estimate the amount of basic, non-specialized study which may be needed.

Opportunities for Graduate Study

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in the fields of morphology, ecology, taxonomy, embryology, physiology (comparative and insect), protozoology, parasitology, entomology (general, taxonomic, economic, and medical), apiculture, wildlife management, and fishery management; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least two years of zoological courses, for part of which credit in other biological sciences may be substituted. Comprehensive courses in general zoology and general chemistry are required of all students. Specific course requirements for the advanced degrees depend upon previous training and experience and upon major field of specialization.

Open to graduate students for minor only: 351, 407, 426, 441, 457, 461, 474.

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Courses in Zoology

Courses Primarily for Undergraduate Students

**101. General Zoology.**

(2-8) Cr. 4 each. 101, F.W. 102, W.S.
(10) Form and activities of representative invertebrates with fundamental principles. For those preparing for medicine. **Prerequisite:** 101.
Continuation of 101 but dealing with vertebrates.

**104. Animal Biology.**

(2-8) Cr. 3 each. 104, F.W.S. 105, F.W.S.
(10) Principles as shown in structure, functions, and habits of invertebrates.
(10) Continuation of 104 but dealing with vertebrates.

**109. Agricultural Zoology.**

(3-3) Cr. 4. F.W.S.
For Agricultural Education, Animal Husbandry and Farm Operation students. Basic facts and principles with applications to farm life.

**155. Elementary Physiology.**

(3-4) Cr. 4. F.W.S.
Basic anatomy and functions of human organ systems. For Home Economics students and other women students who have not had human physiology. May not be counted as credit for zoology majors.

**224. Comparative Anatomy.**

(2-8) Cr. 4. F.W.S.

Prerequisite: 102 or 105.
Study of selected vertebrate types with emphasis on those not examined in general courses.

226. Vertebrate Anatomy.
(3-6) Cr. 4. F.
**Prerequisite:** 106 and P. E. 218.
Vertebrate anatomy with emphasis on regions especially concerned in sports and physical rehabilitation. For physical education men.

234. Vertebrate Embryology.
(2-6) Cr. 4. W.
**Prerequisites:** 224.
Germ cell formation, fertilization, cleavage, tissue and organ development, fetal membranes and their uses. For Science majors.

308. Vertebrate Evolution.
(3-0) Cr. 3. F.B.
**Prerequisites:** 102 or 105.
Outline of evolution from sub-human to human, evidence from fossil record, anatomy and embryonic development of the body.

*A student may receive a maximum of 8 credits toward graduation for these general biology courses. Only one of the following will count toward graduation: Zool. 101, 104; the same applies to 102, 105.*
Courses for Advanced Undergraduate and Graduate Students

**Courses for Advanced Undergraduate Students**

500. Seminar. Cr. 1. F.W.S.
*Prerequisite: 15 credits in zoology. Mr. Harris*
Reports of original investigations, current literature, special features.

502. Zoological Microtechniques. (1-8) Cr. 3. W.
*Prerequisite: 15 credits in zoology, organic chemistry and permission of instructor. Mr. Ulmer*
General and special techniques; microscopy; research methods; individual problems.

503. Evolution of Animals. (3-0) Cr. 3. S.
*Prerequisite: 15 credits in Zoology and Gen. 200.*
Problems and factors in organic evolution, variation, origin, and distribution of life.

511. Protozoology. (2-6) Cr. 4. F.
*Prerequisite: 102 or 105 and 351. Mr. Becker*
Survey of the free-living and parasitic protozoa; identification, life cycles, and host-parasite relationships of forms important to agriculture, wildlife and man. (May be taken at Iowa Lakeside Laboratory for 7 or 8 crs.)

512. Helminthology. (2-6) Cr. 4. W.
*Prerequisite: 102, or 105, and 351. Messrs. Becker, Ulmer*
Survey of the cestodes, trematodes, and nematodes parasitic in wildlife, laboratory animals, and man; study of selected vectors; identification, life histories, and host-parasite relationships emphasized. (Also taught at Iowa Lakeside Laboratory for 7 or 8 crs.)

527. Normal Histology. (3-6) Cr. 4. W.
*Prerequisite: 254, Mr. Hamilton*
Microscopic structure of the tissues and organs of vertebrates in relation to function.

**Courses for Graduate Students**

612. Advanced Parasitology. (3-0) Cr. 3. Alt. S. Offered 1958
*Mr. Becker*
Prerequisite: 511, 512.
Special phases in host-parasite relationships of parasitic protozoa, worms and arthropods.

690. Research
A. Zoology. Messrs. Becker, Hamilton, Ulmer
B. Physiology. Mr. Tauber

**Graduate Students**

508. Gytology. (2-8) Cr. 3. Alt. S. Not offered 1958
*Prerequisite: 324 or 502. Mr. Hamilton*
Structure and function of cells in development, inheritance, histogenesis, and pathological conditions.

534. Embryology. (2-6) Cr. 4. W.
*Prerequisite: 224. Mr. Hamilton*
Principles and processes of development in vertebrates.

538. Experimental Embryology. (2-6) Cr. 4. S.
*Prerequisite: 234 or 534. Mr. Hamilton*
Physiology of germ-cells; parthenogenesis; marking and grafting experiments on living embryos; tissue culture techniques.

550. Comparative Physiology. (3-0) Cr. 3. Alt. S. Offered 1958
*Mr. Tauber*
*Prerequisite: 224, 351, 407.*
Functions in the various phyla, with interpretations in terms of morphology, ecology, and evolution.

551. 552. Advanced Physiology. (3-0 or 3) Cr. 3 or 4 each. F.W.S.
*Prerequisite: 224, 361, 407, organic chemistry.*
551. Nervous system, sense organs and muscle.
552. Circulation, respiration and digestion.
553. Metabolism and endocrine system.

555. General Physiology. (2-0 or 6) Cr. 2 or 4. F.
*Prerequisite: 102, or 105, and organic chemistry. Mr. Tauber*
Principles of animal physiology from study of isolated cells and cell groups.

590. Special Topics
*Cr. 2 to 5. F.W.S.*
A. Zoology. Messrs. Becker, Hamilton, Ulmer
B. Physiology. Mr. Tauber

407. Invertebrate Zoology. (2-6) Cr. 4. S.
*Prerequisite: 102 or 105, Advanced study of invertebrates stressing classification, morphology, life history, and economic relationships.

429. Physical Growth of Children. (3-0) Cr. 3. W.
*Prerequisite: 358 or equivalent.
For Child Development majors. Changes in body structure from infancy through childhood.

457. Physiology of Muscular Activity. (4-0) Cr. 4. S.
*Prerequisite: 226 and 357.*
Essentials of human physiology for majors in muscle, fatigue.

490A. Special Problems in Zoology.
Cr. 2 to 5. F.W.S.
*Prerequisite: 15 credits in zoology and permission of instructor.
Individual problems for beginners in research.

524. Histological Technique.
(1-6) Cr. 3. F.W.S.
*Prerequisite: 102 or 105,*
Methods of fixing, sectioning, mounting, and staining tissues for microscopic study. Preparation of whole mounts.

525. Mammalian Anatomy. (2-6) Cr. 4. S.
*Prerequisite: 224.*
Advanced study and dissection of cat, rabbit or other mammals. Designed for those preparing for study of medicine.

334. Embryology. (2-8) Cr. 3. F.
*Prerequisite: 109.*
Elements of vertebrate embryology including summary of principles of mammalian development. For Animal Husbandry students.

351. Human Physiology. (2-6) Cr. 4. W.S.
*Prerequisite: 102 or 105, and Chem. 102 or 106.*
Essentials of human physiology for majors in zoology and related sciences.

357. Vertebrate Physiology. (2-6) Cr. 4. W.
*Prerequisite: 226.*
Fundamentals of physiology for majors in physical education for men.

358. Physiology of Reproduction. (2-8) Cr. 3. F.W.S.
*Prerequisite: 155 or equivalent.*
Physiological aspects of intra-uterine life; maternal-foetal relationship; reproductive hormones. For Home Economics and other women students. Not open for credit to students who have had Zoology 234 or 354.

590. Special Topics
*Cr. 2 to 5. F.W.S.*
A. Zoology. Messrs. Becker, Hamilton, Ulmer
B. Physiology. Mr. Tauber

607. Physiological Psychology. (3-0) Cr. 3. Alt. S.
*Prerequisite: 224 or 357. Mr. Hamilton*
Principles of higher nervous processes, memory, perception, learning and intelligence (Also taught at Iowa Lakeside Laboratory for 7 or 8 crs.)

647. Human Anatomy. (2-8) Cr. 4. S.
*Prerequisite: 102 or 105.*
Stomach, esophagus, stomach, intestine, liver, pancreas, gall bladder. For Animal Husbandry majors.

*Prerequisite: 102 or 105.*
Animal behavior, classification of animal behavior, learning, automation, recognition, discrimination, habituation, sensation, innervation, volition, emotional responses.

653. Physiology of Organic Metabolism. (3-0) Cr. 3. S.
*Prerequisite: 224 or 234.*
Principles of the metabolism of organic substances, assimilation, growth, nutrition, and appetite.

665. Special Topics in Human Nutrition. (2-0 or 6) Cr. 2 or 4. S.
*Prerequisite: 102 or 105,*
Principles and current trends in human nutrition.

675. Animal Behavior. (2-0 or 6) Cr. 2 or 4. F.
*Prerequisite: 102 or 105,*
Principles and methods of the study of animal behavior with emphasis on species typical of their ecological habitats.

690. Research
A. Zoology. Messrs. Becker, Hamilton, Ulmer
B. Physiology. Mr. Tauber

696. Research
A. Zoology. Messrs. Becker, Hamilton, Ulmer
B. Physiology. Mr. Tauber
Courses in Entomology

Courses Primarily for Undergraduate Students

274. Elementary Entomology. (2-6) Cr. 4. F.
Structure, life history, habits and recognition of common insects, with interesting facts about their relations with man.

374. Farm Insects. (3-3) Cr. 4. W.S.
Life history, recognition and control of principal insects and other arthropods attacking plants and animals.

375. Insects Affecting Horticulture. (3-8) Or. 5. S.
Prerequisite: 274. Identification, life history and methods of control of insects in the home garden, vegetable garden, greenhouse, and greenhouse insect pests.

377. Forest Insects. (2-3) Cr. 3. F.
Prerequisite: 105, or 102. Life histories and habits of insects injurious to forests, forest products and ornamentals.

Courses for Advanced Undergraduate and Graduate Students

501. Animal Ecology. (3-3) Cr. 4. F.
Prerequisite: 102, or 105, 274. Mr. Knight.
Relation of animals to environment; geographic distribution, climatic factors, ecological succession. Field and experimental work.

572. Insect Morphology. (1-6) Cr. 3. F.
Prerequisite: 15 credits in zoology, including 274. Intensive study of the external and internal anatomy and histology of insects.

573. Taxonomy of Immature Insects. (2-6) Cr. 4. S. Mr. Laffoon.
Prerequisite: 572. Identification of immature stages with emphasis on forms of importance to the entomologist and fisheries biologist.

574. Medical and Sanitary Entomology. (2-6) Cr. 4. S.

Courses for Graduate Students

601. Zoological Literature. (3-0) Cr. 3. W.
Prerequisite: 15 credits in Zoology including 274. Mr. Knight.
Review of literature and classical authors of zoology and entomology; nomenclature and related zoological nomenclature.

655. Insect Physiology. (2-0 or 6) Cr. 2 or 4. W. Mr. Tauber.
Prerequisite: 555, 572. Life processes of insects.

670. Advanced Insect Morphology. (3-0) Cr. 3. W.
Prerequisite: 572. Principles of structure and development of insects.

Courses in Fish and Wildlife Management

Courses Primarily for Undergraduate Students

340. Bird Study. (1-3) Cr. 2. S.
Recognition in field and laboratory; habits, songs, values of birds.

387. Amphibians and Reptiles. (2-3) Cr. 3. S.
Prerequisite: Course in zoology or botany.
Common amphibians and reptiles; recognition, life history and ecology.

441. Game Birds and Mammals. (2-3) Cr. 3. F.
Prerequisite: 109 or equivalent. Recognition, habits and values of major game species of the United States; general management principles and practices.

461. Fishes. (2-3) Cr. 3. W.
Prerequisite: 109 or equivalent. Common fishes of North America; recognition, life history and habits.

490E. Special Problems in Fish and Wildlife Management. Cr. 2 to 5. F.W.S.
Prerequisite: 15 credits in zoology and permission of instructor.
Individual problems for beginners in research.
Courses for Advanced Undergraduate and Graduate Students

505. Limnology. (2-3) Cr. 3. F.
Prerequisite: 102 or 105, and Chem. 102.
Mr. Carlander
Physical, chemical, and biological conditions of lakes and streams as an environment for animals.

543, 544. Wildlife Management Techniques. (3-3) Cr. 4 each. W.S.
Prerequisite: 641. Mr. Hendrickson
543. Techniques of management of game mammals for maximum production and utilization.

Courses for Graduate Students

644. Wildlife Administration. (8-0) Cr. 3. F.
Prerequisite: 543, 544. Mr. Hendrickson
Organization, financing, personnel and supervision of federal, state, and private wildlife programs.

645. Wildlife Conservation. (3-0) Cr. 3. W. Mr. Hendrickson
Prerequisite: 548, 544.
Theories and principles of wildlife conservation, management practices, and special topics.

662. Techniques of Fishery Research. (3-8) Cr. 4. F. Mr. Carlander
Prerequisite: 562.
Continuation of 543 but treating game birds.

562. Fishery Management. (3-3) Cr. 4. S.
Prerequisite: 401, 505. Mr. Carlander
Management policies and practices relating to maintenance and improvement of fishery resources.

Short Courses
R. M. VEQUAIN, M.S., Chairman
Curtiss Hall, Room 121

Iowa State College's short courses are open to everyone interested in the information they offer. They are conducted for two purposes: To enable men and women in the same field to meet for a discussion of mutual problems, and to give them an opportunity to discuss and study their problems with college specialists in the light of most research findings. Since each course is limited in scope and time, they all deal directly and practically with the field indicated.

A few weeks before the opening of each course, detailed information regarding rooms, registration, location of meeting, study program and speakers may be obtained.

The short course bulletin illustrating and giving a descriptive write-up of each course is printed October 1 each year. A copy may be had upon request by writing the chairman.

Experiment Stations and Research Institutes

Agricultural Experiment Station

Administrative Staff

JAMES H. HILTON, B.S., M.S., D.Sc., President
FLOYD ANDRE, Ph.D., Director
GEORGE M. BROWNING, Ph.D., Associate Director
PEARL SWANSON, Ph.D., Assistant Director
RICHARD K. FREVERT, Ph.D., Assistant Director

Resident Collaborators

LANDY B. ALTMAN, JR., Agricultural Engineering Research Branch, USDA
WAYNE BLACKBURN, Soil and Water Conservation Research Branch, USDA

1Collaborator is a person working on an active Experiment Station project whose salary is paid directly by some agency other than Iowa State College and who does not have academic rank.
Since the opening of Iowa State College in 1869 experimental work has been carried forward in agriculture. This work has been devoted to finding facts useful to the people of Iowa—particularly the farm people. Since the passage of the Hatch Act of 1887 by the Federal Congress, the Agricultural Experiment Station has been an integral part of Iowa State College. The research work in Agriculture and Home Economics has been expanded to meet the needs of the farm people of Iowa. This has been possible through the annual appropriations made available by the Hatch Act of 1887, the Adams Act of 1906, the Purnell Act of 1925, the Bankhead-Jones Act of 1935, and the Research and Marketing Act of 1946, through appropriations made by the State Legislature and through gifts and grants by private donors.

Findings made through research are the basis of the teaching program in agriculture and the extension program in agriculture and home economics. The need to carry on basic as well as applied research that will contribute to the solution of complex problems has been kept in mind at all times.

In addition to the main station in Ames, experimental work is carried on at several outlying farms and in the fields of dozens of farmer cooperators out in the state. These experimental areas have been selected to represent the specific soil types of the state where special problems can be studied on a local basis. The program at the main station is and always has been the backbone of the whole research effort.

In addition to the research being carried on by the departments of Agricultural Engineering, Agronomy, Animal Husbandry, Dairy and Food Industries, Agricultural Business and Rural Sociology, Forestry, Genetics, Horticulture, Poultry Husbandry, Technical Journalism, and Vocational Education, the Agricultural Experiment Station also supports research in Animal Pathology, Agricultural Bacteriology, Botany and Plant Pathology, Agricultural Chemistry, Home Economics, Agricultural Statistics, Economic Entomology and Wildlife.

The results of these studies are made available to the people of Iowa and interested groups elsewhere directly by the research, teaching and extension staffs of the college and by means of Station publications. These publications include Station bulletins, other technical and scientific publications, popular series bulletins (issued jointly by the Agri-
cultural Experiment Station and the Extension Service in Agriculture and Home Economics) and the Iowa Farm Science (published jointly on a monthly basis by the Agricultural Experiment Station and the Extension Service in Agriculture and Home Economics).

**Engineering Experiment Station**

JAMES H. HILTON, B.S., M.S., Sc.D., President  
J. F. DOWNIE SMITH, Sc.D., Director  
GEORGE R. TOWN, D. Engr., Associate Director and Professor of Electrical Engineering

The Iowa Engineering Experiment Station at Iowa State College was organized in 1904 for the purpose of providing organized research of the character needed to foster and develop the industries of the state.

Since its organization the Station has completed research projects intended to encourage the development of the raw materials and natural resources of the state, to increase the utilization of agricultural products and by-products, to aid in establishment of additional industry within the state, and to solve engineering problems arising in municipal, county, and state administrations. The latter problems have included research in purification of industrial wastes, sanitation, and highway and roadway construction.

Current major research projects include studies relating to the engineering properties of soils, highway materials and construction methods, prestressed concrete, farm water supplies, sewage preaeration; the extraction of vegetable oils; the manufacture of fertilizers, electrical power systems, electronic computers, non-linear electrical circuits, and creativity in machine design.

The station is prepared to undertake basic and applied research in the fields of architecture, aeronautics, ceramics, highways, materials, and in civil, electrical, industrial, mechanical, agricultural, and chemical engineering. Studies in valuation and depreciation methods may also be undertaken.

The results of the studies are published in research bulletins, engineering reports and papers, or otherwise made readily available to those interested.

**Industrial Science Research Institute**

JAMES H. HILTON, B.S., M.S., D.Sc., President  
RICHARD S. BEAR, Ph.D., Director

The Division of Science, through its staff in cooperation with other research organizations of the College, sponsors a comprehensive program of research in the sciences. The primary purpose of the program is to aid in the solution of the agricultural and industrial problems of Iowa through the application to these problems of the principles, the techniques, and the improved processes developed in the Departments of Bacteriology, Botany, Chemistry, Economics and Sociology, Geology, History, Government and Philosophy, Industrial Administration, Mathematics, Physics, Psychology, Statistics, and Zoology and Entomology and in Food Technology. The research work is coordinated with that of the Agricultural Experiment Station, the Engineering Experiment Station, the Veterinary Medical Research Institute, and the Institute for Atomic Research.

**Institute for Atomic Research**

JAMES H. HILTON, B.S., M.S., D.Sc., President  
FRANK H. SPEDDING, Ph.D., LL.D., D.Sc., Director  
HARLEY A. WILHELM, Ph.D., Associate Director  
ADOLF F. VOIGT, Ph.D., Assistant to the Director

During World War II Iowa State College played a leading part in the basic research which resulted in the large scale release of atomic energy.

In order that the program of the College in this field might be carried forward in peace-time, the Iowa State College Institute for Atomic Research was authorized by the Iowa State Board of Regents on November 1, 1945. Its purposes are:
To build up and maintain a strong group of scientists working in the fundamental phases of physics and chemistry as they apply to nuclear processes and to develop the aspects of physics, chemistry, metallurgy, engineering and biology, which are naturally associated with these fields.

To have available on the campus a group of experts in these newer developments so that other members of the faculty can consult them concerning the application of these new tools to their own problems.

To encourage cooperation and coordination in this type of research work on the campus on a voluntary basis. Particular emphasis will be placed on borderline fields between the several sciences where expert advice is needed from several different fields.

To serve as a central agency for contracts with the Government in the obtaining of special materials such as isotopes, radioactive tracers, special counting instruments, and similar materials, and to serve as a clearing house for the special information which the Government has at its disposal as a result of war research.

To act for the College as the cooperating agency with the Argonne National Laboratory and the cooperating mid-western universities.

To carry out research in the nuclear and associated fields for the Government when authorized by contract with the College.

To carry out research whereby graduate students may obtain the specialized knowledge and skills which they will need in order to do independent research in these fields. It is obvious that a great many men will have to be trained to use these tools in the interest of national welfare and security since there is an acute shortage of such personnel. The formal course work is given and degrees awarded through the several departments and divisions. The research training is given in the Institute.

In general, the objective of the Institute is to develop the peace-time uses of atomic energy and the by-products from it.

Ames Laboratory of the Atomic Energy Commission

FRANK H. SPEDITING, Ph.D., LL.D., D.Sc., Director
HARLEY A. WILHELM, Ph.D., Associate Director
ADOLF F. VOIGT, Ph.D., Assistant to the Director
WOODROW E. DREESSEN, M.A., Administrative Aide to the Director
ALEXANDER E. EDWARDS, B.S., Administrative Aide to the Director
RAY W. FISHER, B.S., Administrative Aide to the Director
CLARENCE H. RAH, Administrative Aide to the Director
PIET VAN BEMMEL, M.D., D.Sc., Industrial Physician

Due to the outstanding record of achievement made by the Iowa State College project during the war years, the Atomic Energy Commission decided to continue this program of research in the nuclear and associated fields at Iowa State College in the post-war period. Accordingly, it established on the campus one of its major research centers known as the Ames Laboratory of the Atomic Energy Commission. This Laboratory specializes in the basic and pioneering types of researches that are necessary to the development of the fields associated with atomic energy.

The college has leased to the Atomic Energy Commission an area on the campus on which the Commission has completed the Metallurgy Building and the Research Building. The work carried out in these buildings is classified due to the requirements of the Atomic Energy Act. However, since the major part of the work done here is of a fundamental and basic nature, much of the material is soon released for publication in the scientific journals.

Veterinary Medical Research Institute

JAMES H. HILTON, B.S., M.S., D.Sc., President
IVAL A. MERCHANT, D.V.M., Ph.D., Director
HARRY E. BIESTER, V.M.D., Associate Director
Research in the Division of Veterinary Medicine is conducted in all of the departments of the division. The research projects which are selected for study receive approval by the Research Council composed of the heads of the various departments. Some research is carried on in the laboratories on the campus but most of the projects are of such a nature that facilities for isolation of experimental animals must be provided. Such facilities are found at the laboratories of the Institute located one mile south of the campus on Beech Avenue.

In choosing projects for research the council gives preference to those diseases of greatest consequence to the livestock industry of Iowa. Frequent conferences are held with veterinarians in general practice to ascertain the problems of greatest significance to them and the livestock industry.

Cooperative research is carried on with other departments of the College, particularly Animal Husbandry, Poultry Husbandry, Zoology, and Food and Nutrition.

For the most part staff members engaged in research devote their full time to that subject, although most of them aid in the undergraduate teaching program by discussing certain of the diseases which they are investigating. Graduate students may be assigned to members of the research staff for the direction of their graduate program.

IOWA VETERINARY MEDICAL DIAGNOSTIC LABORATORY

Paul C. Bennett, Supervisor
Professor: Monlux
Assistant Professors: Groth, Seaton
Instructor: Strafuss

Laboratory diagnostic service for the livestock industry of Iowa has been provided by the Division of Veterinary Medicine since 1892. For several years there have been both administrative and technical cooperation between the laboratory and the livestock disease branches of state and federal departments of agriculture. A new building completed in 1956 provides expanded laboratory facilities necessary to serve adequately the Iowa livestock industry in disease-control problems, including some of the organized state-wide programs.

Many livestock diseases are transmissible to humans and are of direct concern in public health work. Animal disease diagnostic service then is of value to the entire population of the state.

The laboratory annually receives thousands of specimens for examination from all parts of Iowa. These specimens represent all species of animals found in the state, including poultry and wildlife. Although the primary purpose of the laboratory is to provide technical service to veterinarians and others within the state in the diagnosis of animal diseases, students and research workers in the Division benefit greatly as a result of the variety and number of disease specimens that become available.

Statistical Laboratory

James H. Hilton, B.S., M.S., D.Sc., President
T. A. Bancroft, Ph.D., Director
The Statistical Laboratory was organized in 1933 for the purposes of promoting and fostering the use of statistical methods in the researches of the College and of conducting research in statistical theory and methodology. It was the first statistical center of its kind in the United States, organized on an interdivision basis. Although there is hardly a field of investigation in which statistical methods cannot be used with advantage, rarely in colleges and universities have the persons trained in those methods been brought together into a single organized group. In order to facilitate the development and use of better methods, the Statistical Laboratory cooperates closely with and offers its services to research workers in all departments of the College and the several experiment stations and research institutes.

Veterinary Medical Clinics

M. J. Johnson, Supervisor

Professors: Covault, Emmerson, Fowler, Johnson, Kingrey

Associate Professors: Baker, Lundvall

Assistant Professors: Anderson, Bailey, Chivers, Jensen, Lovell

Veterinary clinics include medical, surgical, obstetrical and radiological clinics for large and small animals. The Stange Memorial Hospital accommodates 62 large animals and 98 small animals. Stalls and kennels are constructed of steel and concrete, thus affording the best of sanitary conditions. Fifteen of the stalls are designed for cattle. Thirty commodious box stalls for horses serve also as quarters for sheep and swine. Isolation quarters are provided for the care of animals suffering from communicable diseases. Clinic rooms and operating rooms are well equipped with stocks, mats, operating tables and other modern equipment. Dispensaries and instrument rooms are conveniently located to serve the clinic and operating rooms and are adequately provided with sterilizers, surgical and diagnostic instruments. Complete Roentgen ray equipment is available for radiography, fluoroscopy and therapy in large and small animals.

Three automobiles are maintained so that students can be taken to the farms to assist in the care of patients that cannot be brought to the hospital. This enables the student to obtain experience in the diagnosis and treatment of various diseases under actual field conditions. The rich livestock-producing area near the college provides an abundance of clinical material of a variety usually found in the veterinarian’s practice.

Junior and senior students are required to spend several hours each day in the clinics. The junior students assist the seniors in the supervised care of sick and injured animals. Scholastic credit in clinical practice, including the junior year, is awarded in each of three quarters of the senior year. The combined judgment of all staff members of the department actively contributing to the clinics determines the final quarter marks of each student.

Clinical conferences are held in the senior year involving detailed discussion of selected clinical cases by student groups, the regular clinic staff, and staff members from the basic departments of anatomy, hygiene, physiology, and pathology. At these conferences the special technics used in diagnostic tests, in administering biologics, collecting blood samples, and other clinical practices are discussed and demonstrated and then practiced by the senior students. Also during his senior year the student is required to do a selected list of operations on living animals and to follow the results of the operation closely.

See Department of Medicine and Surgery and the Department of Obstetrics and Radiology for description of clinical courses.
Extension Services

Extension Service in Agriculture and Home Economics

Administrative Staff

JAMES H. HILTON, B.S., M.S., D.Sc., President
FLOYD ANDRE, Ph.D., Director
MARVIN A. ANDERSON, Ph.D., Associate Director
MAURICE W. SOULTS, B.S., Assistant Director
LOUISE MARIE ROSENFELD, B.S., Assistant Director for Home Economics

Iowa State College serves the people of the state through its coordinated programs of resident teaching, research and extension. The College was authorized to undertake and maintain a system of agricultural extension work by action of the state legislature in 1906. In 1914 the United States Congress passed the Smith-Lever Act which provided for Cooperative Extension Work as a part of the land grant college system. The Smith-Lever Act provided for cooperation between the United States Department of Agriculture, the land grant college, the county government and local organized groups of farm people and others in each state interested in agricultural extension education. Public law 83 of the 83rd Congress amended the Smith-Lever Act and provided for further strengthening of the Extension Service program.

Financial support for extension work in agriculture and home economics comes from state, federal and county appropriations. Under Iowa statute a cooperative relationship exists between the Extension Service and the county Agricultural Extension District (which cooperates with Iowa State College and the United States Department of Agriculture in educational activities in the county). The Extension Service works with many different organizations, agencies and institutions and offers educational services to all people of Iowa, especially farm people.

It is the responsibility of the Extension Service in Agriculture and Home Economics to carry the results and benefits of research to all people of the state. It is the purpose of the Service to reach every farm family and also urban dwellers interested in agriculture and home economics. It is recognized that all citizens of the state are directly or indirectly concerned with agriculture and are to be offered the benefits of the Service.

The program in extension is broad in scope, including balanced farm production, conservation of national resources, efficient marketing and distribution of farm-raised products, improved standard of living on farms and in farm homes, youth development and education, community improvement, better relations between rural and urban people and greater participation by rural people in public affairs.

The activities of members of the extension staff embrace the fields of animal husbandry, dairy husbandry, poultry husbandry, dairy and food industries, veterinary medicine, agricultural engineering, agronomy, botany, and plant pathology, forestry, horticulture, zoology and entomology, economics and sociology, music and recreation, applied art, child development, home management, food and nutrition, and textiles and clothing. Assistance is given to both adult and youth groups. Nearly 50,000 local volunteer leaders assist in their home counties and communities in carrying on the various extension activities.

The Extension Service in Agriculture and Home Economics works with farm organizations, cooperative associations, breed associations, farm management associations, dairy herd improvement associations and many other similar organizations. It also works with the Agricultural Stabilization and Conservation Service, Soil Conservation Service, Farmers Home Administration, Rural Electrification Administration of the Federal Department of Agriculture, farm credit and vocational agricultural groups, soil conservation district personnel and various other official agencies. It cooperates with the public schools, churches and various other civic and community organizations of the state.

Extension information on agriculture and home economics subjects is disseminated through meetings, conferences, training schools, demonstrations, visual aids, by radio, through the local and daily press, farm journals, bulletins, pamphlets, circulars and other media.

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Preparation for Extension Service in Agriculture and Home Economics

Attractive opportunities are open each year in extension education in agriculture and home economics to properly qualified graduates of these divisions.

The preparation required for successful performance in this field varies considerably. Field workers find a rather broad education in technical agriculture and home economics and in related sciences, plus systematic education, is highly desirable. The training required for subject matter specialists, is more concentrated in one of the various areas of agriculture or home economics instruction. For both groups the special training suggested above should be supplemented by appropriate courses in psychology, speech, sociology, technical journalism and vocational education.

The specific course requirements are outlined on page 58 for agricultural extension preparation and on page 182 for home economics preparation.

Staff Services

In addition, by arrangement or state statute, services are available in the following fields: dairy testing, soil testing, seed laboratory, vaccination schools, soil conservation, music, drama, library, human health, visual aids and Extension studies.

The service prepares and produces many radio programs and publishes and distributes large amounts of printed materials.

For more complete information about Extension programs send requests to Dean Floyd Andre, Director, Curtiss Hall, Iowa State College, Ames, Iowa.

Engineering Extension Service

JAMES H. HILTON, B.S., M.S., D.Sc., President
J. F. DOWNS SMITH, Sc.D., Director
G. ROSS HENNINGER, B.S., Assistant Director

By action of the State Legislature in 1913, the Iowa Engineering Extension Service was established at Iowa State College to serve the people of the state along engineering and industrial lines, appropriately coordinated with resident instruction and engineering research. Engineering Extension Service has been active since that time, both on-campus and asfield throughout the state. Its programs are supported by state appropriations to a limited extent, by fees of the participants and by reimbursable funds from the Federal Government administered through the Vocational Division of the State Department of Public Instruction.

Extension Classes

General Information. Extension classes are conducted wherever in the state enough persons are interested in one subject to make such classes feasible, and subject to the availability of qualified instructors. Two kinds of extension classes are offered: (1) Those qualifying for regular college credit, and (2) those not qualifying for college credit, taken as "refresher" or service courses. The level of instruction offered ranges from vocational or "practical" to collegiate post-graduate, depending upon the needs and interest of specific class groups.

CREDIT COURSES. Extension classes for college credit, including certain regular catalog courses, are taught by members of the College faculty and are conducted under established College regulations the same as with corresponding on-campus classes. These include:

1. Vocational-Industrial Teacher Training. The Engineering Extension Service has been designated to offer, on the campus and through extension the required industrial teacher training courses as set up in the State Plan for Vocational Education. These are: I.Ed. 510, 514, 518, 519, 524 and 525, and may be taken under either Special or Graduate classification. Assistance is available also to local school districts for special problems of industrial instruction in the day or evening schools.

2. Graduate instruction in Engineering and Technical Subjects. This offering relates to certain regular catalog courses of the Engineering Division, and by special arrangements may extend to other courses.
SERVICE COURSES. This is a non-credit classification and includes the following general categories of adult-education activities:

1. Trade and Industrial Training. One phase of this program of personnel training offers courses in supervisory, management and instructional techniques for groups of foremen and other management personnel in industry. These courses are presented through extension classes held in the locality of the industries being served. Another phase of this program offers training courses in the trades, at apprentice or higher levels, through extension classes usually held on the campus. Instruction normally is given by Engineering Extension staff specialists.

2. Industrial and Technical Short Courses. In co-operation with educational trade and industrial organizations, a broad program of short courses, conferences and clinics is offered on the campus and at various points throughout the state. These courses vary in length from one day to several weeks, depending upon the nature of the subject matter and the needs of the particular class group. Instruction is intensely practical and consists of lectures, discussions, demonstrations and laboratory work. Instructors include consulting engineers, qualified professional experts from business and industry and members of the regular College teaching staff. Typical examples of short courses include: TV Service Clinics, Diesel Power-Plant Conferences, Methods-Time Measurement and other Industrial Management schools, Midwest Gas schools, Highway Engineering courses, Power Network Analyzer short courses, Telephone Plant short courses, Industrial Electronics schools, County Engineers' conferences, Surveyors' conferences, City Engineers' conferences, Better Concrete conferences, Heating and Ventilating conferences, Custodians' schools, technology for industries and others.

3. Firemanship Training. Engineering Extension Service is the state's designated agency for firemanship training. Classes are held throughout the state all year, culminating in the Annual State Fire School each year in the late spring. Included are county and departmental schools for volunteer departments, departmental schools for paid departments, industrial brigade schools, specialized schools for fire department officers and instructors and for fire inspectors. These various classes are designed to meet local conditions. They deal with such specific problems as fire-fighting techniques, fire prevention methods, the effective use of proper equipment, and fire department organization. Instruction is given by Engineering Extension staff specialists, augmented by other selected professional authorities.

4. Industrial Safety Correspondence Course. An Industrial Safety Correspondence Course has been developed by the Industrial Association of Iowa in cooperation with Engineering Extension, Iowa State College.

The course is designed for those industries in Iowa which do not have a full-time safety specialist—by and large, the small firms. It also serves as a supplementary course for larger firms which wish to pass additional safety information to their supervisors. Enrollment is limited to 200.

The course, which is administered by Engineering Extension, consists of 12 lesson units which are to be completed in a year. The cost of the course includes the text material, the grading and the examination of papers and the postage on all material sent from the college to the students. When the course is satisfactorily completed, two certificates are given—a larger one for framing and a smaller one for the wallet.

Technical Information Service

In addition to instructional services, Engineering Extension Service undertakes to make technical information available to the people of Iowa through lectures, exhibits, published bulletins and answers to inquiries.

Additional information may be obtained from G. Ross Henninger, Engineering Extension Service, Marston Hall, Iowa State College, Ames, Iowa.
Summary of Degrees Conferred
1955-1956

BACCALAUREATE DEGREES 1872-1956

PRESENT CURRICULA

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DISCONTINUED CURRICULA

Agricultural Course, leading to degree of B.S., 1870-1880
Agricultural Course, leading to degree of B.S.A., 1883-1888 and 1894-1904
Agricultural and Manual Training, leading to degree of B.S., 1922-1933
Agriculture and Science, 1929-1940
Agronomy Course, leading to degree of B.Ag., 1891-1898
General Agriculture, 1937-1939
Genalog Science, 1932-1935
General Science Course for Women, 1872-1880 and 1904
General and Domestic Science Course, leading to degree of B.L., 1887-1899
General and Domestic Science Course, leading to degree of B.Ph., 1899-1900
General and Domestic Science Course, leading to degree of B.S., 1901-1908
Home Economics and Agriculture, leading to degree of B.S., 1917-1930
Ornamented Ceramics, leading to degree of B.S., 1932-1937
Science and Agricultural Course, leading to degree of B.S., 1899-1900 and 1909-1914

Baccalaureate Degrees Conferred, 1872-1956

HIGHER DEGREES 1872-1956

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Higher Degrees Conferred, 1872-1956

All Degrees Conferred, 1872-1956
Summary of Enrollment

1955 - 1956

For students whose status changed within the period from July 1, 1955 to June 30, 1956, the latest classification within the year is used as the basis for these enrollment statistics.

### Undergraduate College Students

<table>
<thead>
<tr>
<th>DIVISION</th>
<th>Senior</th>
<th>Junior</th>
<th>Sophomore</th>
<th>Freshman</th>
<th>Special</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Academic year</td>
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</tr>
<tr>
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<td>Total excluding duplicates</td>
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</tr>
<tr>
<td>Non-Collegiate Students</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Graduate College Students</td>
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### Graduate, Collegiate, and Non-Collegiate Students

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<th>Graduate College Students</th>
<th>Graduate, Collegiate, and Non-Collegiate Students</th>
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### Duplication

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### Net Total

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For students whose status changed within the period from July 1, 1955 to June 30, 1956, the latest classification within the year is used as the basis for these enrollment statistics.
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## Division of Engineering

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### Faculty Distribution

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<td>Chemical and Mining Engineering</td>
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### Total Students

<table>
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**Note:** The above table represents the distribution of students across different academic divisions and years. The totals indicate the number of students in each category.
### DIVISION OF HOME ECONOMICS

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<th>Subject</th>
<th>Undergraduate Collegiate Students</th>
<th>Non-Collegiate Students</th>
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Note: The table includes the breakdown of students across different academic years and majors within the Home Economics division, highlighting the number of undergraduates and non-collegiate students.
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<td><strong>DIVISION OF VETERINARY MEDICINE</strong></td>
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Enrollment, 1955-56

(A summary of different individuals enrolled during the year)

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th>Fiscal Year</th>
<th>Men</th>
<th>Women</th>
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<tbody>
<tr>
<td>Grand total of all students</td>
<td>8129</td>
<td>2319</td>
<td>10448</td>
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<tr>
<td>Total of all students of college grade</td>
<td>8080</td>
<td>2160</td>
<td>10240</td>
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<td>I. Students in residence of college grade</td>
<td>7976</td>
<td>2070</td>
<td>10044</td>
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<td>Agriculture</td>
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<td>Science</td>
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<td>318</td>
<td>2361</td>
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<td>Veterinary Medicine</td>
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<td>278</td>
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<td>2083</td>
<td>10325</td>
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<td>10054</td>
<td></td>
<td>8422</td>
<td>2348</td>
<td>10770</td>
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<tr>
<td>II. Students not in residence of college grade, extension, off-campus</td>
<td>102</td>
<td>84</td>
<td>186</td>
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<td>115</td>
<td>88</td>
<td>201</td>
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<tr>
<td>III. Students in residence, not of college grade. Music and driver training</td>
<td>49</td>
<td>159</td>
<td>208</td>
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<td>85</td>
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Summer Quarter Students, 1955

<table>
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<tr>
<th>Divisions</th>
<th>First Term Only</th>
<th>Second Term Only</th>
<th>Twelve Weeks</th>
<th>Total</th>
<th>Summer and Academic Year</th>
<th>Students Attending Summer Only</th>
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<tbody>
<tr>
<td>Agriculture</td>
<td>230</td>
<td>198</td>
<td>420</td>
<td>755</td>
<td>544</td>
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<td>Engineering</td>
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<td>123</td>
<td>332</td>
<td>744</td>
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<td>135</td>
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<td>Science</td>
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<td>Veterinary Medicine</td>
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<td>370</td>
<td>1381</td>
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SHORT COURSES
July 1, 1955 to June 30, 1956

DIVISION OF AGRICULTURE

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<th>Course</th>
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<td>Agricultural Credit School for Bankers</td>
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<td>Beekeepers</td>
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<tr>
<td>Bulk Milk Cooling</td>
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<td>Cattle Feeders</td>
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<td>Cooperative Directors and Managers</td>
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<td>Crop Conference</td>
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<td>Crop Improvement</td>
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<tr>
<td>Dairy Industry Day</td>
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<tr>
<td>Drainage and Conservation Contractors</td>
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<tr>
<td>Elevator and Farm Supply Managers</td>
<td>121</td>
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<td>Elevator and Farm Supply Assistant Managers</td>
<td>53</td>
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<tr>
<td>Farm Electrification Training School for 4-H Leaders</td>
<td>134</td>
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<td>Farm Managers, Iowa Association</td>
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<td>Farm Safety</td>
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<td>Fertilizer Dealers</td>
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<td>Fertilizer Manufacturers</td>
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<td>Flock and Lamb Feeders</td>
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<td>Forestry Workshop</td>
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<td>Goat Management for Farm Equipment Manufacturers</td>
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<td>Greenskeepers and Turf Association</td>
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<td>Guidance</td>
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<td>Hatchery Flock Selection and Pullorum Testing School</td>
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<td>Horse and Mule Breeders</td>
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<td>Horticultural Groups</td>
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<td>Beekeepers</td>
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<td>Fruit Growers</td>
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<td>Gladiolus Society</td>
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<td>Garden Club</td>
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<td>Rose Growers</td>
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<td>4-H Boys</td>
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<td>Industrial Education Teachers</td>
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<td>Iowa Institute of Cooperation</td>
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<td>Irrigation Conference</td>
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<td>Landscape Clinic for Nurserymen</td>
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<td>Lighting Farm</td>
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<td>Livestock Judging</td>
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<td>Newspapersmen</td>
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<td>Nutrition School for Feed Dealers and Manufacturers</td>
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<td>Pest Control</td>
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<td>Presbyterian Rural Pastors</td>
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<td>Prospective Teachers</td>
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<td>Raw Products (Canners)</td>
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<td>Rural Pastors Institute</td>
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<tr>
<td>Rural Young People Leaders Training School</td>
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<tr>
<td>Rural Youth Assembly</td>
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<td>School Board Secretaries</td>
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<td>Seed Analysts, Beginners</td>
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<tr>
<td>Seed Dealers</td>
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<td>Seminary Students</td>
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<td>Soil Conservation District Commissioners</td>
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<td>Soil Management and Land Valuation</td>
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<tr>
<td>Swine Feeders</td>
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<td>Town and Community Planning</td>
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<tr>
<td>Tractor School for 4-H Leaders</td>
<td>148</td>
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<tr>
<td>Turkey Flock Selection and Pullorum Testing School</td>
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<td>Water Resources Seminars, Iowa</td>
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<td>Water Systems</td>
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<td><strong>Total</strong></td>
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DIVISION OF ENGINEERING

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<th>Course</th>
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<tr>
<td>Area Short Courses</td>
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<tr>
<td>American Society for Engineering Education</td>
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<tr>
<td>Asphalt Conference</td>
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<td>Better Concrete</td>
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<td>Building Code Conference</td>
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<td>Building Code Workshop</td>
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<td>City Engineers</td>
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<td>Contractors Safety School</td>
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<td>Correction Education Workshop</td>
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<td>County Engineers</td>
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<td>Custodian School</td>
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<td>Diesel Power Plant Conference</td>
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<td>Electrical Apprentice</td>
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<td>Engineer-in-Training License</td>
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<td>Fire Department Inspectors School</td>
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<td>Fire Department Instructors School</td>
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<td>Firemanship Training Advisory Committee</td>
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<td>Fire School (State)</td>
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<td>Highway Instrumentmen's School</td>
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<td>Housekeeping for Custodians</td>
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<td>Industrial Safety Correspondence Study</td>
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<td>L.P. Gas Service School</td>
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</table>
## SHORT COURSES

- Methods-Time-Measurement, Advanced ....................................................... 20
- Methods-Time-Measurement, Basic .............................................................. 3
- Mid West Gas Conference ............................................................................. 337
- Power Network Analyzer I ........................................................................... 33
- Pre-Apprentice Masonry School .................................................................. 24
- Religious Architecture .................................................................................. 56
- Structural Clay Products ............................................................................... 57
- Structural Engineering Conference ............................................................... 65
- Supervisor’s Building and Grounds ............................................................... 13
- Surveyor’s Conference .................................................................................. 65
- Swimming Pool Operators .......................................................................... 34
- Telephone Dial Conversion School ............................................................... 25
- TV Color School ............................................................................................ 15
- Welding School .............................................................................................. 55

Total .................................................................................................................. 4,069

## Extension Classes:

- Custodian-Engineer ....................................................................................... 75
- Engineering Credit ......................................................................................... 33
- Firemanship Training ...................................................................................... 3,629
- Industrial Electronics Training ...................................................................... 146
- Industrial Teacher Training ........................................................................... 161
- Industrial Supervisory Training ................................................................. 276
- Sewage Plant Operators .............................................................................. 26

Total .................................................................................................................. 4,346

## DIVISION OF HOME ECONOMICS

- Alumnae Institute ......................................................................................... 201
- Cattle Feeders “Hey” Day ........................................................................... 76
- Crop Improvement .......................................................................................... 53
- Family Life Conference .................................................................................. 748
- 4-H Girls ......................................................................................................... 1,613
- Iowa Institute of Cooperation ......................................................................... 62
- Nursery Operators and Nursery School Children ........................................ 25
- School Lunch (beginners) .............................................................................. 60
- Swine Producers ............................................................................................ 10
- Vocational Home Economics Teachers ......................................................... 262

Total .................................................................................................................. 3,110

## DIVISION OF VETERINARY MEDICINE

- Annual Conference for Veterinarians ............................................................ 151

Total .................................................................................................................. 151

## Grand Total Enrollment

................................................................. .................................................. 25,591
The Faculty
(Including members of Research and Extension Staffs)

JAMES H. HILTON, President, 1953, 1923**
B.S. Iowa State, 1922; M.S. Wisconsin, 1937; D.Sc. Purdue, 1945; D.Sc., Cornell College, 1955

JAMES HERBERT JENSEN, Professor of Botany and Provost (1) 1953
B.S. Nebraska, 1928; M.S., 1930; Ph.D., Wisconsin, 1935

CHARLES EDWIN FRALEY, President Emeritus, Professor of Vocational Education, 1953, 1932

RAYMOND MOLLYNEAUX HUGHES, Professor, President Emeritus, 1936, 1927
A.B., Miami, 1893; M.S., Ohio, 1897; L.L.D., Miami, 1927; L.L.D., Coe, 1928; L.L.D., Iowa State, 1936

HENRY L. ABLIN, Instructor in Electrical Engineering (1) 1955
B.S., South Dakota School of Mines, 1953

DUANE C. ACKER, Assistant Professor of Animal Husbandry (1, 2) 1956, 1952
B.S., Iowa State, 1952; M.S., 1953; Ph.D., Oklahoma A&M., 1957

ROBERT F. ACKER, Assistant Professor of Bacteriology, (1, 6) 1954
B.S., Indiana, 1942; M.A., 1948; Ph.D., Rutgers, 1953

HARRIET ADAMS, Associate Professor of Applied Art (1) 1952, 1944
B. of Design, Kansas, 1930; M.A., Western Reserve, 1934

SUZANNE FAYE ADAMS, Instructor in Food and Nutrition (1) 1956
B.S., Iowa State, 1954; M.S., Iowa, 1956

DAVID SAMUEL ADORNO, Instructor in Mathematics (1) 1956

JOHN M. AYKMAN, Professor of Botany (1, 2) 1945, 1927
A.B., Nebraska Wesleyan, 1917; A.M., 1921; Ph.D., Nebraska, 1928; D.Sc., Nebraska Wesleyan, 1951.

FRANK C. ALBERS, Research Associate (8) 1955
B.A., St. John's, 1955

HENRY H. ALBERS, Associate Professor of Industrial Economics (1, 6) 1953, 1949
B.A., Iowa, 1941; M.A., 1946; Ph.D., Yale, 1951

BOB E. ALEXANDER, Capt., Assistant Professor of Air Science (1) 1955
B.S., Texas A&M., 1943

JACK M. ALEXANDER, Assistant Farm Manager; Instructor in Agriculture (1) 1954
B.S., Iowa State, 1950

BARBARA RUTH ALDRED, Research Associate (8) 1954
B.A., Knox College, 1934

EDWARD SWITZER ALLEN, Professor of Mathematics (1) 1943, 1921
A.B., Harvard, 1909; A.M., 1910; Ph.D., 1914

HAZEL ALLEN, Assistant Professor of English (1) 1953, 1945
B.S., Minnesota, 1929; M.A., Claremont Graduate School, 1949

ROBERT SCOTT ALLEN, Professor of Chemistry (1, 2) 1957, 1940
B.S., Brigham Young, 1939; M.S., 1940; Ph.D., Iowa State, 1949

RAYMOND R. ALLMARAS, Associate, Agronomy (1) 1957
B.S., North Dakota Agricultural, 1952; M.S., Nebraska, 1956

MAURICE WILLIAM ALMFELDT, Associate Professor of Engineering Drawing (1) 1951
B.S., Rhode Island State, 1932

WAYNE ALQUIST, Instructor in English and Speech (1) 1957
B.A., Nebraska, 1957

WILLIAM EUGENE AMES, Assistant Professor of Technical Journalism (1) 1954, 1949
B.S., South Dakota State, 1948; M.S., Iowa State, 1952

ARTHUR LAWRENCE ANDERSON, Professor of Animal Husbandry (1) 1946, 1920
B.S., Minnesota, 1916; M.S., Iowa State, 1922

* The general faculty consists of the President, Provost, Deans, Business Manager, Registrar, Personnel Directors, Librarian, all professors and associate professors and such other members of the college staff as the President may designate.

** First date after the name indicates date of appointment to present position; the second date, when the first fails to do so, indicates the date of first appointment in the college.

† The following numbers in parentheses are used to identify the staff members with instruction extension service or research. (1) Instruction; (2) Agricultural Experiment Station; (3) Agricultural and Home Economics Extension Service; (4) Engineering Experiment Station; (5) Engineering Extension Service; (6) Industrial Science Research Institute; (7) Information Service; (8) Institute for Atomic Research; (9) Statistical Laboratory; (10) Veterinary Medical Research Institute.
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<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution(s)</th>
<th>Years</th>
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<tbody>
<tr>
<td><strong>ARTHUR R. ANDERSON</strong></td>
<td>Research Associate (8)</td>
<td>Loyola</td>
<td>1954</td>
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<tr>
<td><strong>DON MAX ANDERSON</strong></td>
<td>Instructor in Modern Languages (1)</td>
<td>Maine, M.A., Iowa; Ph.D.</td>
<td>1955</td>
</tr>
<tr>
<td><strong>ERNEST W. ANDERSON</strong></td>
<td>Professor of Aeronautical Engineering</td>
<td>North Dakota Agricultural, M.S., Iowa State</td>
<td>1955, 1926</td>
</tr>
<tr>
<td><strong>EVELYN ROSE ANDERSON</strong></td>
<td>County Extension Home Economist (3)</td>
<td>Iowa State</td>
<td>1957</td>
</tr>
<tr>
<td><strong>ERNEST W. ANDERSON</strong></td>
<td>Professor of Aeronautical Engineering and Head of the Department</td>
<td>Iowa State, 1928; Ph.D., 1933</td>
<td>1955, 1926</td>
</tr>
<tr>
<td><strong>FRANK A. ANDERSON</strong></td>
<td>Assistant Professor of Veterinary Medicine and Surgery (1)</td>
<td>Iowa State</td>
<td>1956</td>
</tr>
<tr>
<td><strong>GLENDON R. ANDERSON</strong></td>
<td>Instructor in Modern Languages (1)</td>
<td>Colorado A&amp;M.</td>
<td>1955, 1951</td>
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<tr>
<td><strong>MABEL ANDERSON</strong></td>
<td>Instructor in Institution Management (1)</td>
<td>Minnesota</td>
<td>1932, 1926</td>
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<tr>
<td><strong>MARVIN A. ANDERSON</strong></td>
<td>Associate Professor of Agronomy</td>
<td>Iowa State, 1939; M.S., 1949; Ph.D., 1955</td>
<td>1955, 1926</td>
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<tr>
<td><strong>PAUL M. ANDERSON</strong></td>
<td>Instructor in Electrical Engineering (1, 4)</td>
<td>Iowa State</td>
<td>1955, 1949</td>
</tr>
<tr>
<td><strong>VINCENT M. ANDERSON</strong></td>
<td>Associate Professor of Agriculture; District Extension Supervisor (3)</td>
<td>Iowa State</td>
<td>1948, 1928</td>
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<tr>
<td><strong>WILLARD R. ANDERSON</strong></td>
<td>Assistant Professor in Agricultural Engineering (1)</td>
<td>Iowa State</td>
<td>1956, 1950</td>
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<tr>
<td><strong>FLOYD ANDRE</strong></td>
<td>Dean of the Division of Agriculture and Director of the Agricultural Experiment Station and the Agricultural and Home Economics Extension Service</td>
<td>Iowa State</td>
<td>1949, 1932</td>
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<tr>
<td><strong>MAURICE ANDREWS</strong></td>
<td>Research Associate (8)</td>
<td>Iowa State</td>
<td>1957</td>
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<tr>
<td><strong>RAY E. ARMSTRONG</strong></td>
<td>Assistant Professor of Agricultural Engineering (1, 2)</td>
<td>Iowa State</td>
<td>1948, 1947</td>
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<tr>
<td><strong>CARL ANTON ARNVAL</strong></td>
<td>Assistant Professor of Engineering Drawing (1)</td>
<td>Minnesota, Iowa State</td>
<td>1955, 1952</td>
</tr>
<tr>
<td><strong>FLOYD JAY ARNOLD</strong></td>
<td>Professor of Dairy Husbandry (3)</td>
<td>Iowa State</td>
<td>1947, 1927</td>
</tr>
<tr>
<td><strong>LIONEL K. ARNOLD</strong></td>
<td>Professor of Chemical Engineering (1, 4)</td>
<td>Iowa State, 1926; M.S., 1940</td>
<td>1940</td>
</tr>
<tr>
<td><strong>LOTTE ARNWEB</strong></td>
<td>Associate Professor of Food and Nutrition, (1, 2)</td>
<td>California (Berkeley)</td>
<td>1944, 1952</td>
</tr>
<tr>
<td><strong>SAMUEL AROFF</strong></td>
<td>Associate Professor of Botany (1, 8)</td>
<td>California (Los Angeles); California (Berkeley)</td>
<td>1948, 1942</td>
</tr>
<tr>
<td><strong>RONALD F. AROSON</strong></td>
<td>Assistant State Boys' 4-H Leader (3)</td>
<td>Iowa State</td>
<td>1956, 1954</td>
</tr>
<tr>
<td><strong>IRA W. ARTHUR</strong></td>
<td>Associate Professor of Economics (1, 3)</td>
<td>Iowa State, 1916; M.S., 1927; Ph.D., Minnesota</td>
<td>1937, 1927</td>
</tr>
<tr>
<td><strong>RICHARD E. ATKINS</strong></td>
<td>Associate Professor of Farm Crops (1, 2)</td>
<td>Kansas State, 1941; Iowa State, 1942; Ph.D., 1948</td>
<td>1950, 1941</td>
</tr>
<tr>
<td><strong>GRACE M. AUGUSTINE</strong></td>
<td>Professor of Institution Management and Head of the Department (1, 2)</td>
<td>Iowa State</td>
<td>1944</td>
</tr>
<tr>
<td><strong>HARRY AUSPRICE</strong></td>
<td>Instructor in Speech (1)</td>
<td>New York State College for Teachers at Buffalo</td>
<td>1954, 1956</td>
</tr>
<tr>
<td><strong>JOHN CLIFTON AYRES</strong></td>
<td>Professor of Dairy Industry (1, 2)</td>
<td>Illinois State Normal, Illinois, Ph.D.</td>
<td>1954, 1946</td>
</tr>
<tr>
<td><strong>QUINCY C. AYRES</strong></td>
<td>Professor of Agricultural Engineering (1)</td>
<td>Illinois State Normal, M.S., Illinois, Ph.D.</td>
<td>1945, 1920</td>
</tr>
<tr>
<td><strong>ROBERT Z. BACHMAN</strong></td>
<td>Research Associate (8)</td>
<td>Iowa State</td>
<td>1951</td>
</tr>
<tr>
<td><strong>DONALD M. BAILEY</strong></td>
<td>Research Associate (8)</td>
<td>Illinois State Normal</td>
<td>1954</td>
</tr>
<tr>
<td><strong>JAMES H. BAILEY</strong></td>
<td>Assistant Professor of Veterinary Medicine and Surgery (1)</td>
<td>Iowa State</td>
<td>1956</td>
</tr>
<tr>
<td><strong>D.V.M.</strong></td>
<td>Loyola</td>
<td>Iowa State</td>
<td>1946</td>
</tr>
</tbody>
</table>
EARL S. BAIRD, Professor of Industrial Management (5) 1944, 1924  
B.S., Iowa State, 1926; M.S., 1932

DURWOOD L. BAKER, Associate Professor of Veterinary Medicine and Surgery (1) 1951, 1947  
D.V.M., Iowa State, 1943

MERLE PORTER BAKER, Associate Professor of Dairy Industry (1) 1946, 1922  
B.S., Iowa State, 1921; M.S., 1923; Ph.D., 1931

ARTHUR LAWRENCE BAKKE, Professor of Botany (1, 2) 1925, 1910  
B.S., Iowa State, 1909; M.S., 1911; Ph.D., Chicago, 1917

A. GORDON BALL, Associate Professor of Economics (1, 2) 1955, 1949  
B.S.A., Toronto, 1949; M.S., Iowa State, 1950; Ph.D., 1954

CHARLES R. BALLANTyne, Associate, Agronomy (2) 1956  
B.A., Iowa State, 1930; M.A., 1931

STANLEY LEO BALLOUN, Associate Professor of Poultry Husbandry (1, 2) 1955, 1949  
B.S., Iowa State, 1930; Ph.D., 1952

Dale Roger Balmer, Associate, Assistant TV Supervisor (7) 1955, 1952

ARDEN A. BALLON, Associate Professor of Dairy Industry (2) 1956  
B.S., Iowa State, 1921; M.S., 1923; Ph.D., 1931

GEORGE W. BANK, Professor of Sociology (1, 2) 1955, 1949  
B.S., Iowa State, 1943; M.S., 1947; Ph.D., 1953

EDWARD W. BAUGHMAN, Instructor in Dairy Industry (1) 1955, 1949  
B.S., Iowa State, 1937; M.S., 1939

IRENE BEAVERS, Assistant Professor of Home Economics; District Home Economics Supervisor (1, 3) 1955, 1952  
B.S., Peabody, 1948; M.S., Iowa State, 1953

ELLERY RONALD BECKER, Professor of Zoology (1, 6) 1935, 1925  
A.B., Colorado, 1921; D.Sc., Johns Hopkins, 1923

CRAIG E. BEER, Instructor in Agriculture Engineering (1, 2) 1955  
B.S., Iowa State, 1950
RUSSELL J. BEERS, Assistant Professor of Bacteriology (1, 6) 1957
B.S., Nebraska, 1933; M.S., 1935; Ph.D., Illinois, 1936

ETTA GENE BEERY, Instructor in Botany (1) 1956
B.A., Iowa State Teachers, 1930; M.S., Iowa State, 1933

J. THOMAS BELL, Jr., Assistant Professor of Veterinary Anatomy (1) 1956
D.V.M., Georgia, 1952; Ph.D., Minnesota, 1956

EDWARD ANTHONY BENBROOK, Professor of Veterinary Pathology (1) 1957, 1918
V.M.D., Pennsylvania, 1914

RAYMOND R. BENEE, Associate Professor of Economics (1, 2) 1950, 1945
B.S., Iowa State, 1940; M.S., 1946; Ph.D., Minnesota, 1949

CHARLES L. BENNET, Associate, Extension Photographer (3) 1955, 1951

PAUL CLIFFORD BENNETT, Professor of Veterinary Pathology; Supervisor of Iowa Veterinary Medical Diagnostic Laboratory (1) 1948, 1947
B.S., West Virginia, 1923; M.S., 1925; D.V.M., Ohio State, 1931

WILLIAM F. BENNETT, Associate (3) 1951
B.S., Oklahoma A&M., 1950; M.S., Iowa State, 1952

Dwight W. BENSEND, Professor of Forestry (1) 1947
B.S., Minnesota, 1937; Ph.D., 1942

JAMES D. BENSON, Assistant Professor of Industrial Administration (1) 1952
B.S., Creighton, 1949; M.A., Iowa, 1952

RONALD CHARLES BENTLEY, Associate Professor of Economics; Market Editor WOI (3) 1948, 1925
B.S., North Dakota State, 1923; M.S., 1924

Hobart BERESFORD, Professor of Agricultural Engineering and Head of the Department (1, 2, 3) 1946
B.S., Iowa State, 1924; A.E., 1941

Rex Beresford, Professor of Animal Husbandry (3) 1950, 1916
B.S.A., Iowa State, 1911

HENRY DALE BERGMAN, Dean Emeritus, Division of Veterinary Medicine; Professor of Veterinary Physiology and Pharmacology (1) 1910
D.V.M., Iowa State, 1910

JOHN D. BERLIN, FTC, Instructor in Naval Science (1) 1956

BURL V. BERRY, Assistant Professor of Physical Education for Men (1) 1950
B.S., Iowa State Teachers, 1932; M.S., Iowa State, 1946

ALLEN B. BESs, Assistant Professor of Industrial Administration (1) 1956
B.S., Missouri Valley, 1950; M.A., Missouri, 1951

RoscotE E. BEvANS, M/Sgt., Instructor in Military Science (1) 1955

ELIZABETH BEVERIDGE, Professor of Household Equipment and Head of the Department (1, 2) 1953
B.S., Iowa State, 1929; M.S., Iowa State, 1934

HARRY EDWARD BIEESTER, Professor and Head of Animal Pathology; Associate Director of the Veterinary Medical Research Institute (2, 10) 1949, 1920
V.M.D., Pennsylvania, 1919

DONALD L. BIGGS, Assistant Professor of Geology (1) 1956
A.B., Missouri, 1949; A.M., 1951; Ph.D., Illinois, 1957

EMERSON W. BIRD, Professor of Chemistry and Dairy Industry (1, 2) 1947, 1923
B.S., Pennsylvania State, 1923; Ph.D., Iowa State, 1929

MARIE MARLE BISHOP, Assistant Professor; Assistant State Girls' 4-H Club Leader (3) 1953, 1942
B.S., Colorado State, 1929; M.S., Iowa State, 1934

WARREN B. BOST, Professor of Electrical Engineering and Head of the Department (1, 4) 1954, 1934
B.S., Kansas, 1933; M.S., 1934; Ph.D., Iowa State, 1936
MAGDY L. BOCTOR, Instructor in Engineering Drawing (1) 1956
B.S., Cairo (Egypt), 1948; M.S., Minnesota, 1955

MARY M. BODWELL, Assistant Professor; District Home Economics Supervisor, (3) 1953
B.S., Colorado A&M., 1931; M.A., Colorado State Teachers, 1933

GEORGE E. BOEHMKE, Assistant Professor; Assistant State Boys' 4-H Club Leader (3) 1949, 1944
B.S., Iowa State, 1943; M.S., 1953

JOE MEL BOLLEN, Associate Professor of Sociology (1, 2) 1955, 1947
B.S., Iowa State, 1947; M.S., 1948; Ph.D., 1954

JACK BOHN, Research Associate (8) 1956
B.S., Iowa State, 1955

DONALD E. BOLES, Assistant Professor of Government (1) 1956, 1955
B.S., Wisconsin, 1950; M.S., 1953; Ph.D., 1956

JOHN H. BOLTON, Bulletin Editor (4) 1949
A.B., West Virginia Wesleyan, 1921; A.M., Kansas, 1934

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B.A., Iowa, 1948

FRANK EDWARD BORLLE, Associate Professor of Mathematics; Assistant to the Dean of the Division of Science (1) 1956, 1942
B.S., Texas A&M., 1931; M.S., 1932; Ph.D., Iowa State, 1949

THOMAS BOTT, Research Associate (8) 1956
B.S., Notre Dame, 1956

CLARK C. BOWEN, Associate Professor of Botany (1, 6) 1956, 1955
B.S., Michigan State, 1949; M.S., 1950; Ph.D., 1953

DALE W. BOWEN, Instructor in Electrical Engineering (1, 4) 1956
B.S., South Dakota School of Mines, 1955; M.S., Iowa State, 1956

GEORGE E. BOWEN, Assistant Professor of Physics (1, 6) 1954
B.S., California Institute of Technology, 1949; Ph.D., 1953

MADGE H. BOWERS, Assistant Professor of Physical Education for Women (1) 1951, 1924
B.S., Battle Creek, Michigan, 1927

JOHN GILBERT BOWNE, Assistant Professor of Veterinary Anatomy (1) 1956, 1950
B.S., Iowa State, 1950; D.V.M., 1953; M.S., 1956

DAVID RAY BOYLAN, JR., Professor of Chemical Engineering (1, 4) 1956, 1948
B.S., Kansas, 1943; Ph.D., Iowa State, 1952

DOUGLAS W. BRADLEY, Instructor in Physical Education for Men (1) 1957

WENDELL H. BRAGONIER, Professor of Botany and Head of Department (1, 2, 3, 6) 1950, 1939
B.A., Iowa State Teachers, 1933; M.S., Iowa State, 1941; Ph.D., 1947

CHARLES E. BRANDNER, Instructor in Veterinary Hygiene (1) 1956
A.B., Stanford, 1952; D.V.M., Colorado A&M., 1956

FRED A. BRANDNER, Assistant Professor of Mathematics (1) 1943, 1922
B.S., Kansas State Teachers, 1921; M.S., Chicago, 1923

WILLIAM H. BRANDS, Maj., Assistant Professor of Military Science (1) 1957
B.S., Princeton, 1936

FRANK E. BRANDT, Associate Professor of Speech and Drama (1) 1953, 1946
B.A., Iowa State Teachers, 1938; M.S., Iowa State, 1948

ROBERT WILLIAM BRECKENRIDGE, Associate Professor of Mechanical Engineering (1) 1956, 1929
B.S., Iowa State Teachers, 1933; M.S., Iowa State, 1941; Ph.D., 1947

LILLIAN E. BREHM, Assistant Professor of Textiles and Clothing (1) 1949
B.S., Nebraska, 1925; M.A., 1939

RAYMOND HUGO BRENDXMUTH, Associate, Forestry (2) 1952
B.S., Minnesota, 1930; M.S., Purdue, 1952

WILMA DE NEELL BREWER, Professor of Food and Nutrition (1, 2) 1957
B.S., Kansas State, 1935; M.S., State College of Washington, 1939; Ph.D., Michigan State, 1950

RAYMOND D. BRIGHAM, Associate, Botany (2) 1956, 1955
B.S., Texas Technological, 1950; M.S., Iowa State, 1952

RALPH E. BRILEY, Research Associate (8) 1951
B.S., Iowa State, 1918

TOM ALBERT BRINDLEY, Professor of Entomology (1, 2) 1950
B.S., Iowa State, 1928; M.S., 1929; Ph.D., 1934

NELLE JEAN BRINK, Instructor in Mathematics (1) 1955
B.S., Iowa State, 1955

WINONA N. BROOKS, Instructor in Textiles and Clothing (1) 1955
B.S., Tennessee, 1959; M.S., Alabama, 1955
CHARLES HARVEY BROWN, Professor of Library and Bibliographer (1) 1922
B.A., Wesleyan (Connecticut), 1897; M.A., 1899; B.L.S., New York State Library School, 1923; Litt.D., Wesleyan (Connecticut), 1937

DONALD W. BROWN, Associate Professor of Industrial Administration (1) 1952, 1951
B.S., Kansas State, 1942; M.B.A., Denver, 1946; C.P.A., Iowa, 1950

FRANK EMERSON BROWN, Professor of Chemistry (1, 6) 1923, 1917
A.B., Kansas State Teachers, 1911; B.S., Chicago, 1913; Ph.D., 1918

JAMES M. BROWN, Assistant Professor of Veterinary Medicine and Surgery (1) 1957
D.V.M., Iowa State, 1951

JUNE C. BROWN, Assistant Professor of Applied Art (3) 1951, 1949
B.S., Michigan State, 1924

ROBERT GROVER BROWN, Associate Professor of Electrical Engineering (1, 4) 1956, 1948
B.S., Iowa State, 1948; M.S., 1951; Ph.D., 1956

ROBERT RAY BROWN, Research Associate (8) 1954
B.S., Willamette (Salem, Oregon), 1954

GEORGE M. BROWNING, Professor of Soils and Associate Director of the Agricultural Experiment Station (1, 2) 1951, 1947
B.S., Missouri, 1932; M.S., West Virginia, 1934; Ph.D., 1938

JOHN ARTHO BROWNING, Associate Professor of Botany (1, 2) 1956, 1953
B.S., Baylor, 1947; Ph.D., Cornell, 1953

CHARLOTTE H. BRUNER, Instructor in Modern Languages (1) 1942
B.A., Illinois, 1938; M.A., 1939

DAVID KINCAID BRUNER, Professor of English (1) 1953, 1941
A.B., Washington (St. Louis), 1933; A.M., 1934; Ph.D., Illinois, 1941

JOHN H. D. BRYAN, Assistant Professor of Genetics (1, 2) 1954
B.S., Sheffield, 1947; M.A., Columbia, 1949; Ph.D., 1952

RAY JAMES BRYAN, Professor of Vocational Education and Head of the Department (1, 2) 1951, 1946
B.S., Kansas State, 1933; M.S., 1937; Ph.D., Nebraska, 1940

MARION BRYSON, Associate (6) 1955
B.S., Missouri, 1949; M.A., 1950

IRENE HAYNES BUCHANAN, Associate Professor of Textiles and Clothing; Placement Director, Home Economics Administration (1) 1953, 1937
B.S., Iowa State, 1923; M.S., 1938

ROBERT E. BUCHANAN, Dean Emeritus of Graduate College; Research Professor of Special Research and Development (2) 1904
B.S., Iowa State, 1904; M.S., 1906; Ph.D., Chicago, 1908

ROMA J. BUCHEKNAU, Instructor in Music (1) 1955
B.M.E., Nebraska, 1950; M.M., 1953

WALTER F. BUCHHOLTZ, Associate Professor of Botany (1, 2) 1945, 1931
B.S., Iowa State, 1929; M.S., 1930; Ph.D., 1935

GRIFFITH J. BUCK, Assistant Professor of Horticulture (1, 2) 1953, 1948
B.S., Iowa State, 1948; M.S., 1949; Ph.D., 1953

MARIE ALVERTA BUDDELOFF, Associate Professor of Home Management (1) 1949, 1942
B.S., Iowa State, 1952; M.S., 1943

HAROLD ROLLAND BUHL, Assistant Professor of Mechanical Engineering (1) 1956, 1953
B.S., Iowa State, 1948; M.S., 1955

CLARENCE EVERETT BUNDE, Associate Professor of Vocational Education (1) 1954, 1938
B.S., Iowa State, 1929; M.S., 1934

LEE G. BURCHINAL, Associate, Economics (2) 1955
B.A., Otterbein, 1951; M.A., Bowling Green State, 1952; Ph.D., Ohio, 1956

HARVEY RALPH BURKHOLDER, Research Associate (8) 1954
B.S., North Dakota, 1954

GEORGE BURNET, Jr., Associate Professor of Chemical Engineering (1, 8) 1956, 1950
B.S., Iowa State, 1948; M.S., 1949; Ph.D., 1951

ERNIE PATRICIA BURNS, Assistant Professor of Technical Journalism (1) 1956
B.A., Iowa, 1932; M.A., 1933

HARRY GLENN BURRELL, Associate, Sports Editor (7) 1941
B.A., Iowa, 1933; M.A., 1946

WISE BURROUGHS, Professor of Animal Husbandry (1, 2) 1953, 1951
B.S., Illinois, 1934; Ph.D., 1939

ARTHUR E. BURTON, Assistant Professor of Architecture and Architectural Engineering (1) 1949, 1946
B.S., Iowa State, 1942; M.S., 1947

JAMES D. BURTON, Associate, Forestry (1, 2) 1955
B.S., West Virginia, 1949; M.F., Yale, 1950
LINVILLE J. BUSH, Associate, Dairy Husbandry (2) 1957, 1955
B.S., Kentucky, 1948; M.S., Ohio, 1949

LEE WRIGHT BUTLER, Assistant Professor of Physics (1) 1921, 1919
A.B., Simpson, 1914

ROBERT O. BUTLER, Instructor in Engineering Drawing (1) 1955
B.S., Iowa State, 1951

HENRY S. BYRNE, Instructor in Industrial Engineering (1) 1955
B.S., Iowa State, 1952

SALLY ANN BYSTROFF, Research Associate (8) 1954
B.S., Colorado A&M, 1954

F. WAYNE CALDERWOOD, Research Associate (8) 1949
B.S., Iowa State, 1946

ROGER C. CAMP, Instructor in Electrical Engineering (1) 1955
B.S., Oklahoma A&M, 1955

KENNETH D. CARLANDER, Associate Professor of Zoology (1, 6) 1948, 1946
B.A., Minnesota, 1956; M.S., 1938; Ph.D., 1943

MARY AGNES FRANCES CARLIN, Professor of Food and Nutrition (1, 2) 1953, 1945
B.S., Teachers College Columbia, 1931; M.A., 1933; M.S., Cornell, 1943; Ph.D., Iowa State, 1947

BILLE C. CARLSON, Assistant Professor of Physics (1, 8) 1954

OSCAR N. CARLSON, Associate Professor of Chemistry (1, 8) 1956, 1943
B.A., Yankton, 1943; Ph.D., Iowa State, 1950

JAMES W. CAROTHERS, Major, Assistant Professor of Air Science (1) 1956
B.B.A., Baylor, 1949

Percy Hamilton Carr, Professor of Physics (1) 1940, 1930
B.S., Furman, 1925; M.S., North Carolina, 1926; Ph.D., Cornell, 1930

JAMES E. CARSON, Assistant Professor of Physics (1) 1955
B.S., Kent State, 1943; S.M., Chicago, 1948

LOWELL L. CARVER, Professor of Vocational Education (1) 1951, 1939
B.S., Iowa State Teachers, 1930; M.S., Iowa State, 1937

WAFFLE LEWIS CASSELL, Professor of Electrical Engineering (1) 1941, 1939
B.S., Colorado, 1922; E.E., 1928; M.S., Purdue, 1946

DAMON VON CATRON, Professor of Animal Husbandry (1, 2) 1953, 1945
B.S., Purdue, 1938; M.S., Illinois, 1945; Ph.D., Iowa State, 1948

Robert Andrew Caughhey, Professor of Civil Engineering (1) 1930, 1919
B.S., Pennsylvania State, 1907; C.E., 1916

WILBER JOHN CAULFIELD, Associate Professor of Dairy Industry (1) 1949, 1944
B.S., Minnesota, 1924; M.S., Pennsylvania State, 1926

HESTER CHADDERDON, Professor of Home Economics Education (1, 2) 1943, 1929
B.S., Nebraska, 1924; M.A., Chicago, 1928; Ph.D., Ohio, 1938

STEPHEN JOHNES CHAMBERLIN, Professor of Theoretical and Applied Mechanics (1) 1949, 1929
B.S., Illinois, 1928; M.S., Iowa State, 1931

PAR-CHUE CHAN, Assistant Professor of Hygiene (1) 1953
A.B., Asbury, 1919; M.D., George Washington, Washington, D.C., 1923

Orville L. Chapman, Instructor in Chemistry (1) 1957
B.S., Virginia Polytechnic Institute, 1954; Ph.D., Cornell, 1957

LEON F. CHARITY, Assistant Professor of Agricultural Engineering (1, 2) 1955
B.S., New Hampshire, 1940; M.S., Virginia Polytechnic Institute, 1952; Ph.D., Cornell, 1956

Don Claude CHARLES, Associate Professor of Psychology (1) 1955, 1951
B.S., Iowa State Teachers, 1941; M.A., Nebraska, 1947; Ph.D., 1951

EDMUND W. CHENG, Assistant Professor of Animal Husbandry (1, 2) 1956, 1951
B.S., Southwest Associated (China), 1940; M.S., Tsing Hua (China), 1943; M.S., Iowa State, 1948; Ph.D., 1952

PREMO CHIOTTI, Associate Professor of Chemistry (1, 8) 1955, 1945
B.S., Illinois, 1938; Ph.D., Iowa State, 1930

WALTER HARRIS CHIVERS, Assistant Professor of Veterinary Medicine and Surgery (1) 1939, 1928
D.V.M., Iowa State, 1928

GEORGE C. CHRISTENSEN, Associate Professor of Veterinary Anatomy (1) 1953
D.V.M., Cornell, 1949; M.S., 1950; Ph.D., 1953

*Lester Earl Clapp, Professor of Soils (3) 1947, 1931
B.S., Iowa State, 1923

*On leave.
THE FACULTY

FRED F. CLARK, Associate Professor of Agriculture; District Extension Supervisor (3) 1938, 1916
B.S.A., Iowa State, 1916

RICHARD GERALD CLARK, Research Associate (8) 1952
A.B., Fort Hays Kansas State, 1946

WILLIAM H. CLAUSEN, Maj., Assistant Professor of Military Science (1) 1955
B.S., Purdue, 1942

NORMAN CLEARY, Associate, Production Manager WOI-AM-FM (7) 1953, 1952
B.S., Iowa State, 1930

WILLIAM H. CLAUSEN, Maj., Assistant Professor of Military Science (1) 1955
B.S., Purdue, 1942; M.E., 1951

MARY A. CLEM, Associate, Statistics (9) 1951, 1925

JAMES JOSEPH CLINTON, M/Sgt., Instructor in Military Science (1) 1954
B.S., Iowa State, 1902; M.S., 1907

KENNETH E. COLLINS, Research Associate (10) 1955
B.A., San Jose State, 1950; M.S., Iowa State, 1955

W.H.L. COOK, Associate Professor of History (1) 1956, 1952
B.A., Iowa State Teachers, 1946; M.S., Wisconsin, 1948; Ph.D., 1951

ROBERT J. COLEY, M/Sgt., Instructor in Military Science (1) 1954

EDGAR V. COLLINS, Jr., Instructor in Chemical Engineering (1, 4) 1956
B.S., Louisiana State, 1944; M.S., Iowa State, 1947

EDGAR VERMONT COLLINS, Professor of Agricultural Engineering (1, 2) 1947, 1914
B.S., Iowa State, 1914

CLARENCE HARTLEY COVANT, Professor of Veterinary Medicine and Surgery (1) 1917, 1917
D.V.M., Ohio, 1911

BELVA LEE COVEY, Associate, Textiles and Clothing (3) 1953
B.A., Pennsylvania College (Oskaloosa, Iowa), 1928

PAUL H. CROWLEY, Associate Professor of Business Administration (1) 1954

HERBERT CLARE COOK, Associate Professor of Government (1) 1930, 1928
B.A., Iowa State Teachers, 1922; M.A., Iowa, 1925; Ph.D., 1926

JAMES P. COOK, Research Associate (8) 1954
B.S., Gonzaga, 1949; M.S., Iowa State, 1957

ARTHUR E. COTT, Associate Professor of Horticulture (3) 1955, 1947
B.S., Missouri, 1943; M.S., 1931

CHARLES CALVIN CULBERTSON, Professor of Animal Husbandry (2) 1950, 1919
B.S., Iowa State, 1918; M.S., 1925

LADIS H. CSANYI, Professor of Civil Engineering (1, 4) 1949
C.E., Brooklyn Polytechnic Institute, 1937; M.C.E., 1940

LOUISE SHEPHERD CUNNINGHAM, Instructor in Food and Nutrition (1) 1956
B.S., Iowa State, 1953
NORVAl H. CURRY, Professor of Agricultural Engineering (1, 2) 1954, 1944
B.S., Iowa State, 1940; M.S., 1948

ADRIAN H. DAANE, Associate Professor of Chemistry (1, 8) 1956, 1941
B.S.A., Florida, 1941; Ph.D., Iowa State, 1950

PAUL A. DAVI\c}, Professor of Entomology (1, 2) 1953
B.A., Illinois, 1940; M.A., 1941; Ph.D., 1947

MARY PHYLLIS DALE, Instructor in Music (1) 1956
B.M., Northwestern, 1955; M.M., 1956

GERARD HARLAN DALY, Research Associate (8) 1952
A.B., San Jose State, 1952

FOREST CHARLES DANA, Professor of Industrial Engineering (1) 1926, 1923
B.S., Washington, 1914; C.E., Iowa State, 1924

MARIAN ELIZABETH DANIELLS, Assistant Professor of Mathematics (1) 1919, 1914
A.B., Kalamazoo College, 1908; A.B., Chicago, 1908; M.S., Iowa State, 1919

HERBERT T. DAVID, Assistant Professor of Statistics (1, 9) 1956

THOMAS A. DAVIDSON, Instructor in English and Speech (1) 1957
B.A., Iowa, 1950; M.A., 1952

PHILLIPS GEORGE DAVIES, Instructor in English and Speech (1) 1954
B.A., Marquette, 1946; M.A., Northwestern, 1947

DAVID H. DENNISON, Research Associate (8) 1951
B.S., Iowa State, 1951

CHARLES HERBERT DEPUY, Assistant Professor of Chemistry (1) 1954
B.S., California, 1948; M.A., Columbia, 1952; Ph.D., Yale, 1953

LOUIS DEVRIES, Professor of Modern Languages (1) 1919, 1913
A.B., Central Wesleyan, 1907; M.S., Northwestern, 1908; Ph.D., 1918

HARRIS E. DICKIE, Assistant Professor of Mathematics (1) 1949, 1946
B.A., Cornell College, 1922; M.S., Iowa State, 1929

DONALD IRA DICKINSON, Instructor in English and Speech (1) 1954
B.A., Colorado A&M, 1949; M.A., New Mexico, 1952

RUSSELL EDWARD DICKINSON, Associate Professor of Physical Education for Men (1) 1953, 1943
B.A., Iowa State Teachers, 1922; M.A., Iowa, 1938

D. J. DAVIS, Associate, Associate General Manager and Program Supervisor WOI-TV (7) 1956, 1952
B.S., Iowa State, 1928; M.S., Minnesota, 1936

SIDNEY PERCY DEAN, Associate, Photographer (7) 1953, 1951

DARRELL DWIGHT DEANE, Assistant Professor of Dairy Industry (2) 1951
B.S., Idaho, 1938; B.S., Nebraska, 1939; Ph.D., Pennsylvania State, 1942

ERVIN LOREN DENTSEN, Assistant Professor of Horticulture (1, 2) 1949, 1946
B.S., Minnesota, 1941; M.S., Iowa State, 1947; Ph.D., 1949

JOHN B. DIXON, 1ST. LT., Assistant Professor of Military Science (1) 1956
B.S., Texas A&M, 1953
THE FACULTY

CHARLES M. DODD, Professor of Ceramic Engineering and Head of the Department (1, 4) 1930
B.Cer.E., Ohio, 1927; Cer.E., 1933

JOHN D. DODD, Associate Professor of Botany (1, 6) 1955, 1949
B.S., New York State College of Forestry, 1938; M.S., Vermont, 1940; Ph.D., Columbia, 1947

ALBERT F. DODGE, Assistant Professor of Farm Crops (2) 1948
B.S., Iowa State, 1931

LYNN DODGE, Associate Professor, Student Health Service (1) 1947
M.D., Buffalo, 1922

CARROLL C. DOLL, Assistant Professor of Horticulture (2, 3) 1956, 1951
B.S., Illinois, 1949; M.S., Kansas State, 1951

RAY O. DONELS, Associate Professor of Physical Education for Men (1) 1941, 1938
B.S., Iowa State, 1929; M.A., Iowa, 1937

CHARLES E. DONEHOOE, Assistant Professor; District Extension Supervisor, County Agri-
cultural Program (3) 1955, 1947
B.S., Iowa State, 1947

JOHN A. DONNAL, 1st. Lt., Assistant Professor of Military Science (1) 1956
B.S., Pennsylvania State, 1953

MARTIN R. DORFF, Associate (9) 1956
B.S., Carnegie Institute of Technology, 1948; M.S., 1952

EDNA DOUGLAS, Associate Professor of Economics (1, 6) 1950, 1945
B.S., North Carolina, 1938; M.A., 1939; Ph.D., 1945

WILLIAM M. DRANE, CAPT., Professor of Naval Science (1) 1956
B.S., United States Naval Academy, 1930

M. BURTON DREXLER, Assistant Professor of English and Speech (1) 1956, 1952
B.A., Johns Hopkins, 1949; M.A., Minnesota, 1951

FREDERICK R. DUKE, Professor of Chemistry (1, 6, 8) 1954, 1948
B.A., South Dakota, 1937; Ph.D., Illinois, 1940

LOLLY DUMENIL, Assistant Professor of Soils (2) 1950, 1946
B.S., Iowa State, 1942; M.S., 1951

ELWIN R. DUNNET, Professor of Agronomy (3) 1956, 1940
B.S., Iowa State, 1939; M.S., 1943; Ph.D., 1954

SELMA EKQUIST DUNCAN, Instructor in Food and Nutrition (1) 1956, 1936
B.S., Iowa State, 1930

JOHN MELVIN DUNLEVY, Associate Professor of Botany (1, 2) 1956, 1953
B.S., Nebraska, 1949; M.S., 1951; Ph.D., 1953

OLIVE JEAN DUNN, Assistant Professor of Statistics (1, 9) 1956
B.A., California (Los Angeles), 1936; M.A., 1951; Ph.D., 1956

RICHARD L. DUNN, Instructor in Mathematics (1) 1956
B.S., Montana School of Mines, 1944; Ph.D., California (Los Angeles), 1956

RALPH M. DURHAM, Assistant Professor of Animal Husbandry (3) 1955
B.S., Colorado A&M, 1948; Ph.D., Wisconsin, 1951

MARGARET ELIZABETH DURIAN, Instructor in Home Economics Education (1) 1954
A.A., Stephens, 1934; B.S., Iowa State, 1936

MARION DWELLE, Associate, Assistant Editor, Publications Office (2, 3, 7) 1947, 1944
B.A., Coe, 1935

EDWARD SAMUEL DYAS, Assistant Professor of Farm Crops (3) 1923, 1916
B.S., Iowa State, 1920

HAROLD A. DYE, Lt. Col., Associate Professor of Military Science (1) 1956
B.S., Georgia Institute of Technology, 1949

LESTER THOMAS EARLS, Professor of Physics (1) 1951, 1938
A.B., Wisconsin, 1927; M.S., 1929; Ph.D., Michigan, 1934

ALVIN RANDALL EDGAR, Professor of Music and Head of the Department (1) 1948, 1935
B.A., Upper Iowa, 1924; M.A., Iowa, 1935; Dr.Mus., Upper Iowa, 1949

RACHEL HARTMAN EDGAR, Associate Professor of Chemistry (1) 1928, 1924
B.A., Ohio, 1917; B.S., 1918; M.S., 1920; Ph.D., 1925

ARTHUR P. EDWARDS, Associate, Agronomy (2) 1956
B.S., Saskatchewan, 1942; B.A., 1950; M.S., 1954

ALVIN C. EGERT, Associate, Economics (2) 1955, 1956
B.S., Kentucky, 1954; M.S., 1955

LEONARD Z. EGLETON, Professor of Poultry Husbandry (3) 1951, 1946
B.S., Michigan State, 1940; M.S., Iowa State, 1946

FLORENCE ANNA EHRENREICH, Professor of Household Equipment (1, 2) 1953, 1945
A.B., California, 1930; M.A., 1936; Ph.D., 1938

HENRY L. EICHLING, Professor of Agriculture (3) 1946, 1911
B.S.A., Iowa State, 1911
KALJU Erx, Associate, Soils (2) 1956
B.S., Iowa State, 1953

CLARENCE RICHARD ELDREDGE, Professor; Extension Editor; Director of Information Service
(2, 3, 7) 1948, 1941
B.S., Iowa State, 1929

JOHN C. ELDREDGE, Associate Professor of Farm Crops (2) 1937, 1921
B.S., Iowa State, 1915; M.S., 1925; Ph.D., 1933

HAROLD B. ELLIS, Lt. Col., Associate Professor of Military Science (1) 1955
B.S., State College of Washington, 1941; M.S., Massachusetts Institute of Technology, 1947

MACK ALLEN EMMERSON, Professor of Veterinary Obstetrics and Radiology and Head of the Department (1) 1944, 1925
D.V.M., Iowa State 1925; M.S. 1928; Dr. Med. Vet., Zurich, Switzerland, 1930

CHARLES M. EMSLIE, Instructor in Electrical Engineering (1) 1956
B.S., Iowa State, 1948

ORVIS P. ENGELSTAD, Associate, Soils (2) 1955
B.S., Minnesota, 1953; M.S., 1954

MENTON H. ENGELHORN, Assistant Professor of Soils (2) 1930, 1925
B.S., South Dakota State, 1923; M.S., Iowa State, 1925

LEWIS P. ENSIGN, COL., Professor of Air Science (1) 1955
B.A., Idaho, 1936

ERCEL SHERMAN EPPRIGHT, Professor of Food and Nutrition and Head of the Department (1, 2) 1945
B.S., Missouri; 1923; M.S., Texas, 1930; Ph.D., Yale, 1936

DONALD R. ERICKSON, Associate, Distribution Assistant (3) 1949

PAUL LESTER ERRINGTON, Professor of Zoology (2) 1948, 1932
B.S., South Dakota State, 1930; Ph.D., Wisconsin, 1932

RAMONA LUELLA ESSECK, Assistant State Girls' 4-H Leader; Associate (3) 1956, 1948
B.A., Iowa State Teachers, 1941

JOHN ELLIS EVANS, Professor of Psychology (1) 1947, 1921
A.B., Indiana, 1910; M.A., 1911; Ph.D., Columbia, 1916

WALTER H. EVANS, Associate Professor of Electrical Engineering (1, 6) 1952, 1947
B.S., Oklahoma, 1946; M.E.E., 1947; Ph.D., Iowa State, 1951

FLOYD MONTE EVANS, Research Associate (8) 1954
B.S., Southeast Missouri State, 1954

LEROY EVERSON, Associate Professor of Botany (1, 2) 1952, 1949
B.S., Minnesota, 1939; M.S., 1948; Ph.D., 1950

MAX VERNON EXNER, Assistant Professor of Music (3) 1949, 1947
A.B., Columbia, 1933; M.A., 1947

DANIEL CLEVELAND FABER, Professor of Electrical Engineering (1, 5) 1951, 1914
B.S., Illinois, 1908; E.E., 1911

LOUIS A. FACTO, Associate, Photographer (2) 1954
B.S., Iowa State, 1951; M.S., 1954

RAYMOND W. FAHLEN, Assistant Professor of Chemical Engineering (1, 8) 1954
B.S., Washington, 1947; M.S., Missouri School of Mines, 1950; Ph.D., Purdue, 1954

FLORENCE FALLGATTER, Professor of Home Economics Education and Head of the Department (1, 2) 1938
B.S., Minnesota, 1917; M.A., Teachers College, Columbia, 1927

JULIA M. FALTINSON, Associate Professor of Home Economics; Assistant Dean of the Division of Home Economics (1) 1955, 1941
B.S., Iowa State, 1941; M.S., Washington, 1947

GLENN E. FANSLOW, Instructor in Electrical Engineering (1) 1955
B.S., North Dakota State, 1953

JAMES L. FARRELL, Research Associate (8) 1956
B.S., St. Thomas, 1956

VELMER A. FASSEL, Professor of Chemistry (1, 8) 1956, 1941
B.A., Southeast Missouri State, 1941; Ph.D., Iowa State, 1947

RUSSELL FAULKNER, Instructor in Physical Education for Men (1) 1957
B.A., Vanderbilt, 1951

LEONARD FERBERG, Associate Professor of English (1) 1950, 1946
B.S., Illinois, 1937; M.A., 1938; Ph.D., 1946

RUDOLPH A. FELDMAN, Instructor in Physical Education for Men (1) 1957
B.S., California (Los Angeles), 1954

ROBERT C. FELINGER, Associate Professor of Mechanical Engineering (1) 1956, 1947
B.S., Iowa, 1947; M.S., Iowa State, 1948

EUGENE S. FERGUSON, Associate Professor of Mechanical Engineering (1) 1956, 1946
B.S., Carnegie Institute of Technology, 1937; M.S., Iowa State, 1955
THE FACULTY

JEAN FERGUSON, Instructor in English and Speech (1) 1957
A.B., Iowa, 1945

HELEN KING FIDLER, Instructor in Applied Art (1) 1945
B.S., Iowa State, 1918; M.S., 1932

ROBERT CHARLES FINCHAM, Assistant Professor of Dairy Husbandry (3) 1948, 1941
B.S., Iowa State, 1941; M.S., 1943

BRUCE JUDSON FINKS, Professor of Soils (1) 1937, 1917
B.S., Iowa State, 1917; M.S., 1918

MABEL C. FISHER, Professor of Applied Art (1) 1957, 1923
Diploma, Pratt Institute, 1933

GEORGE H. FITZELL, Capt., Assistant Professor of Air Science (1) 1955
B.S., Kansas State, 1942

JOHN ROBERT FITZIMMONS, Professor of Landscape Architecture and Head of the Department (1, 3) 1950, 1924
B.S., Colorado A&M, 1921; M.L.A., Harvard, 1924

MABEL ALICE FLEMING, Instructor in English (1) 1912
B.S., Iowa State, 1911

GERALD D. FLESCH, Research Associate (8) 1954
B.S., Wisconsin State, 1953

WILLIAM F. FLORECHINGER, SFC, Instructor in Military Science (1) 1955

GLADSTONE R. FLUEGGE, Assistant Professor of Modern Languages (1) 1952
B.A., Toronto, 1946; M.A., 1947; Ph.D., 1953

DEAN C. FOLEY, Assistant Professor of Botany (1, 2) 1955
B.S., Idaho, 1949; M.S., West Virginia, 1951; Ph.D., Pennsylvania State, 1955

HARLEY A. FORD, M/Sgt., Instructor in Military Science (1) 1954

CHARLES F. FOREMAN, Assistant Professor of Animal Husbandry (1, 2) 1955
B.S., Kansas State, 1948; M.S., 1949; Ph.D., Missouri, 1953

BARBARA ELLEN FORKER, Associate Professor of Physical Education for Women (1) 1951, 1948
B.S., Michigan State Normal, 1942; M.S., Iowa State, 1950; Ph.D., Michigan, 1957

GEORGE R. FOWLER, Professor of Veterinary Medicine and Surgery (1) 1928
B.S., Washington State, 1925; D.V.M., 1925

GERALD WILLIS FOX, Professor of Physics and Head of the Department (1, 6, 8) 1947, 1930
A.B., Michigan, 1923; A.M., 1924; Ph.D., 1926

Karl A. Fox, Professor of Economics and Sociology and Head of the Department (1, 2, 3, 6) 1955
B.A., Utah, 1957; M.A., 1938; Ph.D., California, 1954

RODNEY FOX, Professor of Technical Journalism (1) 1949, 1936
B.S., Iowa State, 1930; M.S.J., Northwestern, 1941

LODGE R. FREDERICK, Associate Professor of Soils (1, 2) 1956, 1955
B.S., Nebraska, 1943; M.S., Rutgers, 1947; Ph.D., 1950

ALBERT E. FREEMAN, Assistant Professor of Dairy Husbandry (2) 1956
B.S., West Virginia, 1957; M.S., 1954; Ph.D., Cornell, 1957

JAMES THOMAS FREEMAN, Associate Professor of Psychology (1) 1956, 1953
B.A., Oklahoma, 1950; M.S., 1950; Ph.D., Northwestern, 1953

RALPH L. FREEMAN, Associate Professor of Mechanical Engineering (1) 1953, 1947
B.S., Michigan, 1939; M.S.; Iowa State, 1950

Dexter French, Professor of Chemistry (1, 2) 1955, 1938
B.A., Dubuque, 1938; Ph.D., Iowa State, 1942

RICHARD K. FREVERT, Professor of Agricultural Engineering; Assistant Director of the Agricultural Experiment Station (1, 2, 3) 1952, 1937
B.S., Iowa State, 1937; M.S., 1940; Ph.D., 1948

KENNETH J. FREY, Professor of Farm Crops (2) 1956, 1945
B.S., Michigan State, 1944; M.S.; Ph.D., Iowa State, 1948

CHARLES EDWIN FRILEY, President Emeritus; Professor of Vocational Education (1) 1953, 1932
B.S., Texas A&M, 1919; A.M., Columbia, 1923; LL.D., Hardin-Simmons, 1929; LL.D., Texas A&M, 1940; Sc.D., Cornell College, 1942; LL.D., Buena Vista, 1955

JAMES S. FRITZ, Associate Professor of Chemistry (1, 8) 1955, 1951
B.S., James Millikin, 1946; M.S.; Illinois, 1946; Ph.D., 1948

MARTIN F. FRITZ, Professor of Psychology; Directing Professor, Student Counseling Service (1) 1956, 1927
B.S., Kansas State, 1924; M.S., 1925; Ph.D., Chicago, 1931

DAVID FULCOMER, Professor of Sociology (1) 1949
B.A., Macalester College, 1932; M.A., Minnesota, 1937; Ph.D., Northwestern, 1942
THE FACULTY

ALMON H. FULLER, Professor of Civil Engineering (1, 4) 1920
C.E., Lafayette, 1897; M.C.E., Cornell, 1898; M.S., Lafayette, 1900; Sc.D., 1936; D. Engr., Iowa State, 1955

ELIZABETH GENEVIEVE FULLER, Associate Professor of English (1) 1953, 1916
A.B., Illinois, 1915; A.M., Michigan, 1922

DAVID A. FULTON, Instructor in Agricultural Engineering (1) 1956, 1955
B.S., Iowa State, 1955; M.S., 1956

HON-PONG, Assistant Professor of Civil Engineering (1, 4) 1955, 1951
B.S.C., Lingnan (Canton, China), 1942; M.S., Iowa State, 1948

GENE A. FUTRELL, Associate, Assistant Market News Editor WOI (3) 1954
B.S., Iowa State, 1951

WILLIAM GEORGE GAESSLER, Associate Professor of Chemistry (2) 1931, 1911
B.S., Ohio, 1911; M.S., 1929

PILAR GARCIA, Instructor in Food and Nutrition (1, 2) 1955, 1950
B.S., Philippines, 1949; M.S., Michigan, 1950; M.S., Iowa State, 1952; Ph.D., 1955

FRANKLIN P. GARDNER, Associate Professor of Farm Crops (1, 2) 1956, 1949
B.S., Virginia Polytechnic Institute, 1949; M.S., Iowa State, 1950; Ph.D., 1952

Mervin L. Gardner, Associate, PA-Transmitter Engineer (7) 1954

Marjorie Stuart Garfield, Professor of Applied Art and Head of the Department (1) 1948
B.F.A., Syracuse, 1926; M.F.A., 1937

William V. Garner, Assistant Professor of Zoology and Entomology (1) 1954
B.S., Ursinus College, 1947; M.A., Boston, 1948; M.S., Pennsylvania State, 1949; Ph.D., California, 1954

Joseph Gardner, Associate, Economics (2) 1956
B.S., Connecticut, 1954; M.S., New Hampshire, 1956

Gordon Elwood Gatherum, Assistant Professor of Forestry (1, 2) 1953
B.S., Washington, 1949; M.S., Utah State, 1951

Carlton J. Gauger, Assistant Professor; District Extension Supervisor, County Agricultural Program (3) 1956, 1947
B.S., Iowa State, 1939; M.S., 1955

Harlan E. Geiger, Associate Professor; State Older Youth Leader (3) 1949, 1935
B.S., Iowa State, 1935; M.S., 1949

Boyd W. George, Instructor in Zoology (1) 1956, 1954
B.A., Iowa, 1948; M.S., 1950

Carl Gesser, Instructor in Mechanical Engineering (1) 1922

Robert Getty, Professor of Veterinary Anatomy and Head of the Department (1) 1951, 1941
D.V.M., Ohio State, 1940; M.S., Iowa State, 1945; Ph.D., 1949

Edwin Gibson, Research Associate (8) 1957
M.S., Iowa State, 1957

Dorothea William Giesey, Instructor in Home Economics Education (1) 1956
B.S., Iowa State Teachers, 1933

Henry Giese, Professor of Agricultural Engineering (1, 2) 1930, 1914
B.S., Iowa State, 1919; M.S., 1927; Arch.E., 1930

Raymond C. Giese, Associate, Assistant Operations Manager, WOI-AM-FM (7) 1952, 1951
B.S., Iowa State, 1950

DeWayne E. Gilbert, Instructor in Farm Crops (1) 1956, 1954
B.S., Iowa State, 1950; M.S., 1956

Walter M. Gilbert, Assistant Professor of Mathematics (1) 1955

Herbert James Gilkey, Professor of Theoretical and Applied Mechanics (1) 1931

Kermit J. Gill, Research Associate (8) 1952
B.S., Hamline, 1952

Henry Gilman, Professor of Chemistry (1, 6) 1923, 1919
B.S., Harvard, 1915; M.S., 1917; Ph.D., 1918

Joseph Charles Gilman, Professor of Botany (1, 2) 1934, 1918
B.S.A., Wisconsin, 1912; M.S., 1914; Ph.D., Washington, (St. Louis), 1915

John A. Givens, Research Associate (8) 1956
B.A., Concordia, 1956
THE FACULTY

DONALD D. GLOWER, Instructor in Engineering Drawing (1) 1954
B.S., Kings Point, 1947; B.S., Antioch, 1953

ORVILLE GOERING, Instructor in Mathematics (1) 1956, 1952
A.B., Bethel (Kansas), 1952; M.S., Iowa State, 1954

ALVIN THEODORE GOETTSCH, Assistant Professor of Agriculture; District Extension Supervisor (3) 1952, 1946
B.S., Iowa State, 1943

CHARLES ALBERT GOETZ, Professor of Chemistry and Head of the Department (1, 2, 6, 8) 1950, 1948
B.S., Illinois, 1932; M.S., 1934; Ph.D., 1938

JOHN E. GONSER, Research Associate (8) 1952
B.S., Kansas State Teachers, 1951; M.S., 1952

ROLAND H. GOOD, Jr., Associate Professor of Physics (1, 8) 1956
B.M.E., Lawrence Institute of Technology, 1944; M.A.E., Chrysler Institute of Engineering, 1946; M.S., Michigan, 1948; Ph.D., 1951

EMERY FOX GOSS, Professor of Dairy Industry (1) 1947, 1919
B.S., Iowa State, 1915; M.S., 1916

MARVIN EARL GOULD, Assistant Professor of Mechanical Engineering (5) 1944, 1943
B.S., Iowa State, 1937

PHILLIP L. GOURLEY, S/Sgt., Instructor in Air Science (1) 1956

CORNELIUS GOUWENS, Professor of Mathematics (1) 1947, 1920
B.S., Northwestern, 1910; A.M., Illinois, 1911; Ph.D., Chicago, 1924

ARTHUR M. GOWAN, Professor, Registrar and Examiner, 1951, 1942
B.A., Iowa State Teachers, 1932; M.A., Iowa, 1939; Ph.D., Iowa State, 1947

JOHN W. GOWEN, Professor of Genetics and Head of the Department (1, 2) 1948, 1937
B.S., Maine, 1914; M.S., 1915; Ph.D., Columbia, 1917

JOSEPH GEORGE GRAÇA, Assistant Professor of Veterinary Physiology and Pharmacology (1) 1953
B.S., St. Thomas, 1939; Ph.D., Minnesota, 1953

EDGAR FISCHER GRAFF, Professor of Agriculture; District Extension Supervisor (3) 1947, 1917
B.S.A., Iowa State, 1917; M.S., 1936

JEWEL GRAHAM, Assistant Professor of Food and Nutrition (3) 1945
B.S., Oklahoma A&M, 1925; M.S., Iowa State, 1932

JOHN G. GRANT, Professor of Hygiene and Head of the Department; Director of the College Hospital and Student Health Service (1) 1936, 1930
B.A., McMaster, 1919; M.D., Manitoba, 1924

JOHN MORRISON GREEN, Instructor in Mechanical Engineering (1) 1952
B.S., Iowa State, 1950

ROBERT W. GREEN, Instructor in Physics (1, 8) 1955
B.S., Morningside, 1943; M.S., Iowa, 1949

JOHN C. GREENE, Associate Professor of History (1) 1956
B.A., South Dakota, 1938; M.A., Harvard, 1939; Ph.D., 1952

J. A. GREENLEE, Professor of History; Assistant to the Dean of the Division of Science and Assistant to the Director of the Industrial Science Research Institute (1, 6) 1955, 1940
B.A., Iowa, 1930; M.A., 1931; Ph.D., 1934

LEWIS L. GREENOUGH, Associate, Producer-Director WOI-TV (7) 1955
B.A., Denison (Granville, Ohio), 1950

JOHN GREENER, Research Associate (8) 1956
B.S., Indiana State, 1955

DANIEL L. GRIFFEN, Jr., Instructor in Industrial Engineering (1) 1956
B.S., Iowa State, 1950; J.D., Drake, 1953

JAMES EDWARD GRIFFIN, Research Associate (8) 1952, 1948
B.S., Iowa State, 1951

AARON H. GROTH, Jr., Instructor in Veterinary Pathology, Iowa Veterinary Medical Diagnostic Laboratory (1) 1954
B.S., Alabama Polytechnic Institute, 1949; D.V.M., 1954

BEN LEO GroVER, Associate, Soils and Agricultural Engineering (2) 1954
B.S., Utah State, 1949; M.S., 1950

GERMAINE GLADYS GUIOT, Professor of Physical Education for Women and Head of the Department (1) 1941, 1940
B.S., Michigan, 1922; M.S., 1933; Ed.D., New York, 1940

HAROLD GUNDERSON, Professor of Entomology (3) 1948, 1935
B.S., Montana State, 1934; M.S., 1935; Ph.D., Iowa State, 1939
JOHN GURLAND, Associate Professor of Statistics (1, 9) 1952
M.A., Toronto, 1942; Ph.D., California, 1948

ELSIE ANN GUTLIE, Instructor in Institution Management; Assistant Dietitian (1) 1956, 1943
B.S., Iowa State, 1927; M.S., 1932

CHARLES SUMNER GWYNNE, Professor of Geology (1) 1951, 1927
A.B., Cornell, 1907; M.S., Syracuse, 1925; Ph.D., Cornell, 1927

LELAND HAACE, Instructor in Mechanical Engineering (1) 1956
B.S., Iowa State, 1953

DONALD K. HAAH, Associate, Liaison Plan Engineer WOI-AM-TV (7) 1952, 1949

MELVIN HARVEY IIAs, Associate, AM Engineer in Charge WOI (7) 1954, 1943

ERNEST STIGF N HABER, Professor of Horticulture and Head of the Department (1, 2, 3) 1947, 1920
B.S., Ohio, 1918; M.S., Iowa State, 1922; Ph.D., 1928

CHARLES SUMNER GWYNNE, Professor of Geology (1) 1951, 1927
A.B., Cornell, 1907; M.S., Syracuse, 1925; Ph.D., Cornell, 1927

LELAND HAACE, Instructor in Mechanical Engineering (1) 1956
B.S., Iowa State, 1953

DONALD K. HAAH, Associate, Liaison Plan Engineer WOI-AM-TV (7) 1952, 1949

MELVIN HARVEY IIAs, Associate, AM Engineer in Charge WOI (7) 1954, 1943

ERNEST STIGF N HABER, Professor of Horticulture and Head of the Department (1, 2, 3) 1947, 1920
B.S., Ohio, 1918; M.S., Iowa State, 1922; Ph.D., 1928

CLARENCE HABE~ANN, Research Associate (8) 1953
B.A., Southern Illinois, 1953

ROBERT HADEK, Assistant Professor of Veterinary Anatomy (1) 1956
D.V.M., Vienna Veterinary School, 1948; Dr.Med.Vet., 1948; Ph.D., Glasgow (Scotland), 1954

JAMES FRANCIS HAFLING, Research Associate (8) 1952
B.S., Kansas State Teachers, 1952; M.S., 1956

JOE HAFLING, Research Associate (8) 1955
B.S., Kansas State Teachers, 1954; M.S., 1955

JOHN W. HAGAN, Instructor in Industrial Engineering (1) 1956
B.S., Iowa State, 1954

CLARENCE HABE~ANN, Research Associate (8) 1953
B.A., Southern Illinois, 1953

ROBERT HADEK, Assistant Professor of Veterinary Anatomy (1) 1956
D.V.M., Vienna Veterinary School, 1948; Dr.Med.Vet., 1948; Ph.D., Glasgow (Scotland), 1954

JAMES FRANCIS HAFLING, Research Associate (8) 1952
B.S., Kansas State Teachers, 1952; M.S., 1956

JOE HAFLING, Research Associate (8) 1955
B.S., Kansas State Teachers, 1954; M.S., 1955

JOHN W. HAGAN, Instructor in Industrial Engineering (1) 1956
B.S., Iowa State, 1954

Laurie C. Haight, Research Associate (8) 1954
B.A., St. Olaf, 1954

Martha T. Halsey, Instructor in Modern Languages (1) 1956
B.A., Goucher, 1954; M.A., Iowa, 1956

Henry A. HAMANN, T/Sgt., Instructor in Air Science (1) 1954

Robert L. Hamblin, Assistant Professor of Sociology (1, 6) 1955
B.S., Utah, 1951; Ph.D., Michigan, 1955

Cecil V. Hamilton, Associate Professor, Student Health Service 1957
B.S., Iowa, 1928; M.D., 1928

Colin Barr Hamilton, Research Associate (8) 1954
B.S., Monmouth, 1954

Howard Laverne Hamilton, Professor of Zoology (1, 6) 1953, 1945
B.A., Iowa, 1927; M.S., 1938; Ph.D., Johns Hopkins, 1941

Gladys E. Hamlin, Associate Professor of Applied Art (1) 1949
Ph.B., Chicago, 1926; M.A., Columbia, 1937

Charles L. Hamm, Assistant Professor of Physics (1, 8) 1955, 1954
B.S., Michigan, 1948; M.S., 1950; Ph.D., 1954

Earl Gullette Hammond, Assistant Professor of Dairy Industry (2) 1953
B.S., Texas, 1948; M.A., 1950; Ph.D., Minnesota, 1953

George Semm Hammond, Professor of Chemistry (1, 6, 8) 1956, 1948
B.S., Bates, 1943; M.A., Harvard, 1947; Ph.D., 1947

Maridale Hanak, Research Associate (8) 1956
B.S., Detroit, 1952; M.S., 1955

Richard L. Handy, Assistant Professor of Civil Engineering (1, 4) 1956, 1951
B.S., Iowa State, 1951; M.S., 1953; Ph.D., 1956

Thomas Edward Hannum, Associate Professor of Psychology (1) 1955, 1949
B.S., Iowa State, 1941; M.S., 1949; Ph.D., Nebraska, 1952

Diana Lee Hansen, Instructor in Mathematics (1) 1955
B.S., Iowa State, 1955

Jean Lee Hansen, Assistant Professor of Child Development (1) 1953, 1949
B.S., Iowa State, 1926; M.S., 1930

Norman J. Hansen, Associate, Forestry (2) 1955
B.S., Iowa State, 1951; M.S., 1954

Robert S. Hansen, Professor of Chemistry (1, 8) 1955, 1948
B.S., Michigan, 1940; M.S., 1941; Ph.D., 1948

A. Maurice Hanson, Associate Professor of Landscape Architecture (1) 1945, 1934
B.S., Iowa State, 1928

Durwin M. Hanson, Associate Professor of Vocational Education (1, 5) 1956, 1949
B.S., Iowa State, 1939; M.S., 1949; Ph.D., 1956

Grant David Hanson, Associate Professor of Library Science and Assistant Director of the Library (1) 1950
A.B., Augustana, 1933; B.S.L.S., Illinois, 1942; A.M.L.S., Michigan, 1945
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JOHN M. HANSON, Instructor in Theoretical and Applied Mechanics (1) 1957, 1956
B.A., South Dakota State, 1953

ROGER S. HANSON, Instructor in Theoretical and Applied Mechanics (1) 1955
B.S., Iowa State, 1954; M.S., Michigan, 1955

JOHN JOSEPH HANWAY, Associate Professor of Soils (2, 3) 1955, 1950
B.S., Nebraska, 1942; M.S., 1948; Ph.D., Iowa State, 1955

DELA E. HARDERG, Assistant Professor of Physiology (1) 1953, 1949
B.A., Iowa, 1929; M.S., 1938; Ph.D., Iowa State, 1933

WAYNE HARDMAN, Col., Professor of Military Science (1) 1954
B.S., Iowa State, 1932

HOWARD P. HARRENS, Assistant Professor of Bacteriology (1, 2) 1954
B.S., Illinois, 1949; M.S., Alabama, 1951; Ph.D., Purdue, 1954

RICHARD C. HARTLEY, Associate Professor of Physiology (1) 1953
A.B., Tarkio, 1931; M.Sc., Washington, 1933; Ph.D., Syracuse, 1951

ALFRED H. HARRIS, III, Associate Professor of Theoretical and Applied Mechanics (1, 4) 1955
B.S., Iowa State, 1947; M.S., Illinois, 1949; Ph.D., 1952

GLEN ROGERS HAWKES, Professor of Child Development and Head of the Department; Professor of Psychology (1, 2) 1953, 1950
B.S., Utah State, 1947; M.S., 1948; Ph.D., Cornell, 1950

GEORGE W. HAWKINS, Associate, Soils (3) 1956
B.S., North Carolina State, 1952; M.S., 1956

EMMIT H. HAYNES, Assistant Professor (3) 1956
B.S., Kentucky, 1951; M.S., 1953

VIRGIL WILFORD HAYS, Associate, Animal Husbandry (2) 1954
B.S., Oklahoma A&M., 1954

LANO N. HAZEL, Professor of Animal Husbandry (1, 2) 1947
B.S., Texas Technological, 1933; M.S., Texas A&M., 1938; Ph.D., Iowa State, 1941

THOMAS ROBERT HAZEN, Assistant Professor of Agricultural Engineering (1, 2) 1956, 1952
B.S., Oklahoma A&M., 1947; M.S., Purdue, 1950; Ph.D., Iowa State, 1956

EARL O. HEADY, Professor of Economics (1, 2) 1949, 1940
B.S., Nebraska, 1939; M.S., 1940; Ph.D., Iowa State, 1945

WALTER B. HEARD, Assistant Professor of Chemistry (1, 2) 1955
B.S., Rice Institute, 1948; Ph.D., Illinois, 1951

HARRY E. HEATY, Associate Professor of Technical Journalism (1) 1957, 1948
B.A., Tulsa, 1941; M.S.J., Northwestern, 1947; Ph.D., Iowa State, 1956

RICHARD C. HEATLY, Instructor in Physical Education for Men (1) 1957
B.A., Oklahoma, 1952

WILLIAM O. HECKMAN, Instructor in English and Speech (1) 1956
A.B., Rutgers, 1947; M.A., Columbia, 1948

JOHN F. HEER, Assistant Professor, Publications Office (2, 3, 7) 1954, 1949
B.S., Iowa State, 1949; M.S., 1953

ROBERT H. HEIDEL, Associate, Soils Extension (3) 1947, 1946
B.S., Mankato State Teachers, 1941

ROBERT H. HEIDEL, Research Associate (8) 1951, 1943
B.E., Mankato Teachers, 1939; M.A., Minnesota, 1942; M.S., Iowa State, 1949

STIRLEY ELAINE HELD, Assistant Professor of Applied Art (1) 1953
B.S., Iowa State, 1945; M.S., 1952

GEORGE OSCAR HENDRICKSON, Professor of Zoology (1, 6) 1951, 1923
B.A., Iowa State Teachers, 1921; M.S., Iowa State, 1926; Ph.D., 1929

G. ROSS HENNINGER, Assistant Director of Engineering Extension (5) 1951, 1950
B.S., Southern California, 1922

JANE MONTGOMERY HERBOLD, Associate Information Assistant (3) 1956
B.S., Iowa State, 1956

ROBERT D. HERMAN, Instructor in Sociology (1) 1955
B.A., Pomona, 1951; M.A., Wisconsin, 1954
JOHN B. HERRICK, Professor of Veterinary Obstetrics (3) 1954, 1948
B.S., Iowa State, 1941; D.V.M., 1946; M.S., 1950

MARGARET JEAN HERRING, County Extension Home Economist (3) 1957
B.S., Iowa State, 1957

RICHARD LAWRENCE HERRNSTADT, Instructor in English (1) 1954
B.S., Wisconsin, 1948; M.S., 1950

EARL ALMON HEWITT, Professor of Veterinary Physiology and Pharmacology (1) 1957, 1915
A.B., Des Moines, 1914; B.S., Iowa State, 1915; D.V.M., 1918; M.S., Minnesota, 1929; Ph.D., 1931

EDWIN T. HIBBS, Associate Professor of Entomology (1, 2) 1955
B.A., Ohio State, 1941; M.S.C., 1943; Ph.D., 1950

ELLIS A. HICKS, Associate Professor of Zoology and Entomology (1) 1955, 1948
B.S., Iowa State, 1938; M.S., 1940; Ph.D., 1947

STEPHEN J. HIEMSTRA, Associate, Economics (3) 1955
B.S., Iowa State, 1953

JAMES F. HILL, CDR, USN, Associate Professor of Naval Science (1) 1955
B.A., Emory, 1941

LAWRENCE R. HILLYARD, Professor of Industrial Engineering; Engineering Personnel Officer (1) 1955, 1936
B.S., Iowa State, 1932; M.S., 1936

JAMES H. HILTON, President, 1953, 1923
B.S., Iowa State, 1922; M.S., Wisconsin, 1937; D.Sc., Purdue, 1945; D.Sc., Cornell College, 1953

HOWARD HARRY HOLES, Associate Professor of Economics (1, 6) 1956, 1950
B.A., Iowa, 1942; A.M., Harvard, 1948; Ph.D., 1950

THOMAS D. HINESLY, Instructor in Agriculture (1) 1955
B.S., Texas A&M., 1952; M.S., 1956

JOHN JAMES LUETT HINRICHS, Professor of Mathematics and Head of the Department (1) 1954, 1929
B.S., Iowa State, 1925; A.M., Harvard, 1927; Ph.D., 1929

THOMAS AUGUST HIPPAKKA, Professor of Industrial Education (1) 1939
B.S., Wisconsin, 1927; M.S., 1929; Ph.D., 1938

DORIS JUNE HITTLE, Instructor in Institution Management; Administrative Dietitian (1) 1942
B.A., Iowa, 1933; Dietetic Dipl., Indiana Medical Center, 1934; M.A., Columbia University Teachers, 1940

RALPH MALCOLM HIXON, Professor of Chemistry; Dean of the Graduate College (1, 2, 6) 1948, 1923
B.S., Iowa State, 1917; Ph.D., Wisconsin, 1921

CHARLES R. HOAGLIN, M/Sgt., Instructor in Air Science (1) 1955

RANDALL A. HOFFMAN, Instructor in Economics (1) 1957, 1954
B.S., Iowa State, 1956; M.S., 1951

MELVIN SIDNEY HOFSTAD, Professor of Animal Pathology (1, 2, 10) 1955, 1946
D.V.M., Iowa State, 1940; M.S., Cornell, 1941; Ph.D., 1944

PEARL HOGREFE, Professor of English (1) 1944, 1931
B.A., Kansas Southwestern College, 1910; M.A., Kansas, 1913; Ph.D., Chicago, 1927

BARBARA E. HOLL, Associate (2) 1956
B.S., Iowa State, 1936

WILLARD F. HOLLANDER, Associate Professor of Genetics (1, 2) 1956, 1951
B.A., Texas, 1933; M.S., Wisconsin, 1934; Ph.D., 1937

NORMA R. HOLLEN, Associate Professor of Textiles and Clothing (1) 1955, 1942
B.A., Iowa, 1934; M.S., Iowa State, 1943

ALFRED HOLMES, M/Sgt., Instructor in Military Science (1) 1956

GLENN E. HOLMES, Associate Professor of Vocational Education (3) 1956, 1950
B.A., Iowa, 1929; M.A., 1933

HOWARD B. HOLROVD, Associate Professor of Mechanical Engineering (1) 1947
B.S., Iowa State, 1924; Ph.D., California Institute of Technology, 1929

DELMAR C. HOMAN, Instructor in English and Speech (1) 1957
B.A., Iowa, 1948; M.A., 1949

PAUL G. HOMEYER, Professor of Statistics (1, 2, 9) 1949, 1937
B.S., Texas A&M., 1934; M.S., 1936

CHAUNCY EUGENE HOOVER, Associate, Transmitter Engineer WOI-TV-FM (7) 1951, 1948

JAMES M. HOOPER, Instructor in Civil Engineering (1, 4) 1955, 1953
B.S., Iowa State, 1953; M.S., 1956
THE FACULTY

Robert E. Hoover, Instructor in English and Speech (1) 1954
B.S., Illinois, 1952; M.A., 1953

Theodore W. Horner, Assistant Professor of Statistics (1, 2, 9) 1953
B.S., North Carolina State, 1949; M.S., 1951; Ph.D., 1953

James C. Horton, Assistant Professor of Botany (1, 2) 1956
B.S., Wisconsin, 1952; Ph.D., 1956

Wilfred Toman Hosmer, Associate Professor of Civil Engineering (1) 1954, 1946
B.S., Iowa State, 1950; M.S., 1950

Grace Eleanor Howell, Instructor in Child Development (1) 1956, 1954
B.S., Missouri, 1952; M.S., Iowa State, 1956

Theodore W. Horn, Assistant Professor of Statistics (1, 2, 9) 1953
B.S., North Carolina State, 1949; M.S., 1951; Ph.D., 1953

Ames C. Howton, Assistant Professor of Botany (1, 2) 1956
B.S., Wisconsin, 1952; Ph.D., 1956

Wilfred Tomato Homser, Associate Professor of Civil Engineering (1) 1954, 1946
B.S., Iowa State, 1950; M.S., 1950

Grace Eleanor Howell, Instructor in Child Development (1) 1956, 1954
B.S., Missouri, 1952; M.S., Iowa State, 1956

Herbert B. Howell, Associate Professor of Economics (3) 1947, 1934
B.S., Iowa State, 1934; M.S., 1945

Elizabeth Ellis Hoyt, Professor of Economics (1, 6) 1927, 1925
A.B., Boston, 1913; A.M., Radcliffe, 1924; Ph.D., 1925

Donald E. Hudson, Assistant Professor of Physics (1, 8) 1951
B.Phys., Minnesota, 1942; Ph.D., Cornell, 1950

Agatha Louise Hufenecker, Instructor in Textiles and Clothing (1) 1956
B.S., Indiana, 1952; M.S., Iowa State, 1956

John Hug, Assistant Professor of Mechanical Engineering (1) 1947, 1909
B.M.E., Iowa State, 1909; M.E., 1934

Harold DeMott Hughes, Professor of Farm Crops (2) 1947, 1910
B.S., Illinois, 1907; M.S.A., Missouri, 1908

Raymond Molynieux Hughes, President Emeritus, 1936, 1927
A.B., Miami, 1893; M.S., Ohio, 1897; LL.D., Miami, 1927; LL.D., Coe, 1928; LL.D., Iowa State, 1936

William L. Hughes, Assistant Professor of Electrical Engineering (1, 4) 1952, 1949
B.S., South Dakota School of Mines, 1949; M.S., Iowa State, 1950; Ph.D., 1952

William V. Hull, Professor of Agricultural Engineering (2) 1950, 1943
B.S., Oregon State, 1923

Dale Otis Hull, Associate Professor of Agricultural Engineering (3) 1954, 1939
B.S., Iowa State, 1939; M.S., 1940

Cornie Leonard Hulsbos, Professor of Civil Engineering (1, 4, 6) 1957, 1946
B.S., Iowa State, 1941; M.S., 1949; Ph.D., 1953

James E. Humphrey, Associate Professor of English (1) 1951, 1948
B.S., Lafayette, 1927; M.A., Michigan, 1948

Donnell R. Hunt, Assistant Professor of Agricultural Engineering (1) 1956, 1951
B.S., Purdue, 1951; M.S., Iowa State, 1954

Dorothea Marie Hunt, Instructor in Library Science (1) 1952
B.S., Purdue, 1951

James E. Hunt, Instructor in Chemical Engineering (1, 4) 1956
B.S., Bucknell, 1951

Keith Gibson Huntress, Professor of English (1) 1946, 1941
B.A., Wesleyan, 1935; M.A., 1936; Ph.D., Illinois, 1942

David Vernon Huntsberger, Associate Professor of Statistics (1, 9) 1955, 1950
B.S., Bethany, 1947; M.S., West Virginia, 1948; Ph.D., Iowa State, 1954

Virginia L. Hurlbut, Associate Professor of Economics (1, 2) 1955
B.S., Montana State, 1933; M.S., Wisconsin, 1936; Ph.D., Iowa State, 1954

Della Candace Hurley, Assistant Professor, Assistant Extension Editor (3) 1947, 1946
B.S., Wisconsin, 1934

John Courtney Hussey, Associate, Staff Artist, Publications Office (7) 1947

Keith Morgan Hussey, Professor of Geology (1, 4) 1955, 1949
A.B., Augustana, 1936; M.S., Louisiana State, 1939; Ph.D., 1940

Charles Dennett Hutchcroft, Assistant Professor of Farm Crops (2) 1953, 1946
B.S., Iowa State, 1946; M.S., 1950; Ph.D., 1955

Edwin L. Ilof, Assistant Professor of Physics (1, 8) 1956
A.B., California (Berkeley), 1948; Ph.D., 1957

John K. IMG, Instructor in Theoretical and Applied Mechanics (1) 1956
B.S., Iowa State, 1956

Lydia L. Inman, Assistant Professor of Household Equipment (1) 1955, 1949
B.S., Iowa State, 1940; M.S., 1950

Charles R. Irby, Lt., Assistant Professor of Naval Science (1) 1956
B.S., Oregon State, 1951

Frances J. Isch, Instructor in Physical Education for Women (1) 1956
B.S., Oberlin, 1956

Duane Isely, Professor of Botany (1, 2, 3) 1956, 1944
B.A., Arkansas, 1938; M.S., 1959; Ph.D., Cornell, 1942
JAMES D. IVERSON, Instructor in Aeronautical Engineering (1) 1956
B.S., Iowa State, 1956

CARROLL ARTHUR IVERSON, Professor of Dairy Industry and Head of the Department
(1, 2, 3) 1938, 1916
B.S., South Dakota State, 1915; M.S., Iowa State, 1917; D.Sc., South Dakota State, 1953

CONNAYIL M. JACOB, Instructor in Theoretical and Applied Mechanics (1) 1956, 1951
B.Sc., Patna, 1943; M. S., Iowa State, 1952

NORMAN LEONARD JACOBSON, Professor of Dairy Husbandry (1, 2) 1953, 1947
B.S., Wisconsin, 1940; M.S., Iowa State, 1941; Ph.D., 1947

EMIL HENRY JEBB, Associate Professor of Statistics (1, 2, 9) 1949
B.S., Iowa State, 1938; M.S., 1941; Ph.D., North Carolina State, 1950

LAURENCE D. JENNINGS, Jr., Assistant Professor of Chemistry (1, 8) 1955
S.B., Massachusetts Institute of Technology, 1950; Ph.D., 1955

ELROY C. JENSEN, Assistant Professor of Veterinary Medicine and Surgery (1) 1956, 1951
D.V.M., Michigan State, 1951

ERLING N. JENSEN, Professor of Physics (1, 8) 1956, 1943
A.B., Drake, 1932; M.A., Columbia, 1933; Ph.D., Iowa State, 1947

JAMES HERBERT JENSEN, Provost and Professor of Botany (1) 1953
B.S., Nebraska, 1928; M.A., 1930; Ph.D., Wisconsin, 1935

HOWARD W. JESPERSEN, Jr., Associate, Statistics (2, 6) 1953
B.S., Rochester, 1930; M.S., 1953

RAYMOND J. JESSEN, Professor of Statistics (1, 2, 6, 9) 1950, 1938
B.S., California, 1937; Ph.D., Iowa State, 1943

DAGMAR HILDEGARDE JOHNSON, Professor of Home Economics Education (1, 2) 1957, 1948
B.S., Minnesota, 1934; M.S., 1944; Ph.D., Iowa State, 1950

HOWARD P. JOHNSON, Associate, Agricultural Engineering (2) 1951, 1949
B.S., Iowa State, 1949; M.S., 1950; M.S., Iowa, 1954

IVER JOHANNES JOHNSON, Professor in Charge of Farm Crops (1, 2, 3) 1947, 1940
B. S., Minnesota, 1928; M.S., 1929; Ph.D., 1931

KENNETH W. JOHNSON, Assistant Professor of Horticulture (1, 2) 1956
B.S., Iowa State, 1952; M.S., Kansas State, 1954

LESLEE E. JOHNSON, Professor of Animal Husbandry and Head of the Department (1, 2, 3)
1954, 1937
B.S., Iowa State, 1929; M.S., 1938; Ph.D., 1941

MAURICE JOSEPH JOHNSON, Professor of Veterinary Medicine and Surgery; Supervisor of
the Veterinary Medical Clinics (1) 1953, 1932
D.V.M., Iowa State, 1932

QUENTIN G. JOHNSON, Instructor in English and Speech (1) 1956
A.B., Gonzaga, 1932; M.A., Oregon, 1956

ROBERT W. JOHNSON, Research Associate (8) 1954
B.S., St. Louis, 1954

RONALD C. JOHNSON, Instructor in English and Speech (1) 1956
B.A., Illinois, 1952

RUSSELL WAYNE JOHNSON, Research Associate (8) 1954
B.S., Iowa State, 1952

W. JOHN JOHNSON, Jr., County Extension Youth Assistant (3) 1957
B.S., Iowa State, 1957

JOHN H. JOHNSTONE, Maj., Associate Professor of Naval Science (1) 1957
B.S., Maine, 1947; M.S., 1930

ETHEL B. JONES, Research Associate (2) 1957
A.B., Vassar, 1952; A.M., Chicago, 1954

L. MEYER JONES, Professor of Veterinary Pharmacology (1) 1947, 1935
A.B., DePauw, 1935; D.V.M., Iowa State, 1939; M.S., 1939; Ph.D., Minnesota, 1945

WALTER PAUL JONES, Professor of English (1) 1932, 1931
A.B., Wabash, 1913; Ph.D., Cornell, 1925

JAMES JOSEPH, Assistant Professor of Physics (1) 1956
B.S., Brooklyn, 1949; Ph.D., Iowa, 1956

GREGOR A. JUNK, Research Associate (8) 1956
B.S., Loras, 1955

GEORGE JUNKHAN, Instructor in Mechanical Engineering (1) 1957
B.S., Iowa State, 1955

MARGARET LOUISE KAGARICE, Associate Professor of Home Economics; District Home Eco-
nomics Supervisor (3) 1956, 1946
B.S., McPherson, 1940; M.S., Iowa State, 1946

STANLEY KAHAN, Instructor in English and Speech (1) 1955
B.A., College of the City of New York, 1953; M.A., Wisconsin, 1954
THE FACULTY

GEORGE E. KALDENBERG, Assistant Professor of Mathematics (1) 1946, 1943
B.A., Iowa Central, 1921; M.S., Iowa State, 1922

DONALD R. KALDOR, Professor of Economics (1, 2, 6) 1956, 1939
B.S., North Dakota State, 1938; M.S., Virginia Polytechnic Institute, 1939; Ph.D., Iowa State, 1942

ROBERT RANKIN KALTON, Associate Professor of Farm Crops (1, 2) 1950, 1941
B.S., Minnesota, 1941; M.S., Iowa State, 1945; Ph.D., 1947

ROBERT KARRAKER, Research Associate (8) 1957
B.A., Southern Illinois, 1953

HIROSHI KATSUOKI, Associate (8) 1956
B.S., Kyushu, 1947

ALFRED PAUL KEHLENBECK, Professor of Modern Languages and Head of the Department (1) 1950, 1935
B.A., Iowa, 1927; M.A., 1928; Ph.D., Wisconsin, 1934

AUGUST E. KEEF, Professor of Horticulture (1, 2) 1955, 1954
B.S., Cornell, 1936; M.S., 1947; Ph.D., 1950

JOSEPH M. KELLER, Professor of Physics (1, 8) 1954, 1946
B.S., Harvard, 1932; Ph.D., California, 1940

ROBERT RANKIN KALTON, Associate Professor of Farm Crops (1, 2) 1950, 1941
B.S., Minnesota, 1941; M.S., Iowa State, 1945; Ph.D., 1947

ROBERT KARRAKER, Research Associate (8) 1957
B.A., Southern Illinois, 1953

HARRY HAZELTON KNIGHT, Professor of Entomology (1) 1934, 1924
B.S.A., Iowa State, 1908; M.S., 1917; D.Agr., North Dakota State, 1940

WILLIAM FRANCIS KENNELL, Associate Professor of Sociology (1, 6) 1956, 1953
B.A., Cambridge, 1940; M.A., 1943

K. ROBERT KERN, Assistant Professor, Assistant Extension Editor (3) 1955, 1950
B.S., Illinois, 1948; M.S., Iowa State, 1955

WILLIAM J. KERRIGAN, Instructor in English and Speech (1) 1955
A.B., St. Ambrose, 1937; M.A., Iowa, 1944

KEITH K. KETCHAM, Instructor in Science; Chief Engineer WOI AM-FM-TV (1, 7) 1956, 1950
B.S., Iowa State, 1949

PETER KILDEE, Dean Emeritus, Division of Agriculture; Professor of Agriculture (3) 1949, 1908
B.S.A., Iowa State, 1908; M.S., 1917; D.Agr., North Dakota State, 1940

WALTER BERNARD KING, Professor of Chemistry (1) 1950, 1923
B.S., Illinois, 1923; M.S., Iowa State, 1924; Ph.D., 1930

BURNELL W. KINLEY, Assistant Professor of Industrial Administration (1) 1952, 1949

ROLAND W. KINNEY, Instructor in Bacteriology (1) 1954
B.S., Detroit, 1949

DON KIRCHHAM, Professor of Soils and Physics (1, 2) 1949, 1946
A.B., Columbia, 1933; A.M., 1934; Ph.D., 1938

WAYNE W. KIRKHAM, Assistant Professor of Veterinary Hygiene (1) 1956
B.S., Iowa State, 1944; M.S., 1954

MILTON E. KIRKPATRICK, Research Associate (8) 1955
B.S., Kansas State Teachers, 1955

JAMES J. KISER, Assistant Professor of Animal Husbandry (1) 1951
B.S., Iowa State, 1942; M.S., South Dakota State, 1951

EDWIN A. KLINE, Assistant Professor of Animal Husbandry (1, 2) 1949, 1948
B.S., Kansas State, 1942; M.S., Washington State, 1948; Ph.D., Iowa State, 1953

DON N. KLEIN, Research Associate (8) 1953, 1952
B.A., Simpson, 1952

HARRY HAZELTON KNIGHT, Professor of Entomology (1) 1934, 1924
B.S., Cornell, 1914; Ph.D., 1920

O. STEVE KNUTSEN, Assistant Professor of Vocational Education; Manager, Film Production Unit (2, 3, 7) 1948
B.A., Iowa State Teachers, 1931; M.A., Iowa, 1938
WINONA F. KOCH, Instructor in Textiles and Clothing (1) 1954
B.S., Oklahoma, 1943; M.S., Tennessee, 1954

LEE R. KOLMER, Assistant Professor of Economics (3) 1956, 1951
B.S., Southern Illinois, 1952; M.S., Iowa State, 1952; Ph.D., 1954

HEROLD LANG KOOPER, Assistant Professor, Director of Visual Instruction (3, 7) 1938, 1924
B.S., Iowa State, 1923

WILLIAM R. KOPP, Capt., Assistant Professor of Military Science (1) 1957
B.S., Arkansas State, 1942

ROY MILTON KOTTMAN, Professor of Animal Husbandry and Associate Dean of the Division of Agriculture (1) 1954, 1946
B.S., Iowa State, 1941; M.S., Wisconsin, 1948; Ph.D., Iowa State, 1952

RICHARD FRANKLIN KOUPAL, Assistant Professor of Music (1) 1954
B.M., Nebraska, 1947; M.M., 1948

RICHARD H. KRAEMER, Instructor in Vocational Education; Film Technician (1, 7) 1956, 1948
B.S., Iowa State, 1951

MILLARD R. KRAUTOVPI, Associate Professor of English; Director of Student Affairs (1) 1956, 1946
A.B., Drake, 1940; A.M., Minnesota, 1948

ORLANDO C. KREIDER, Associate Professor of Mathematics (1) 1955, 1928
B.A., Simpson, 1928; M.S., Iowa State, 1930; M.S., 1941; Ph.D., 1949

RALPH EDWARD KRENZIN, Assistant Professor of Farm Crops (3) 1947
B.S., Kansas State, 1939; M.S., 1947

CAROL ANI KURTENMEYER, Associate, Publications Assistant, Publications Office (3, 7) 1954
B.S., Iowa State, 1951

FRANK B. KULINSKI, Instructor in Botany (1) 1953
B.Sc., Rutgers, 1952; M.S., Massachusetts, 1954

EMELDA KUNAU, Associate, Applied Art (3) 1949, 1941
B.S., Iowa State, 1930

WILLIAM KUNERTH, Associate Professor of Physics (1) 1916, 1907
A.B., Wisconsin, 1904; M.A., 1910; Ph.D., Chicago, 1921

ANNE MARIE KUNTZ, County Extension Home Economist (3) 1957, 1956
B.S., Maine, 1956

FRANCIS A. KUTISH, Professor of Economics (2, 3) 1955, 1936
B.S., Iowa State, 1938; M.S., 1941

WALACE E. LABERGE, Assistant Professor of Entomology (1) 1956
B.S., North Dakota, 1949; M.S., 1951; Ph.D., Kansas, 1955

JOHN CLARENCE LACEY, Instructor in Electrical Engineering (1) 1952
B.S., Iowa State, 1952

GEORGE W. LADD, Assistant Professor of Economics and Sociology (1, 2, 3) 1955
B.S., South Dakota State, 1950; M.A., Michigan State, 1951; Ph.D., Illinois, 1955

JEAN LUTHER LAFFOON, Assistant Professor of Entomology (1) 1953, 1946
B.S., Morningside, 1942; M.S., Iowa State, 1948; Ph.D., 1953

JOHN E. LAGERSTROM, Assistant Professor of Electrical Engineering; Assistant to the Dean of the Division of Engineering (1) 1957, 1946
B.S., Iowa State, 1944; M.S., 1951

VIRGIL S. LACOMARCO, Associate Professor of Vocational Education (1) 1957, 1955
B.A., Coe, 1943; M.S.E., Drake, 1948; Ph.D., Iowa State, 1955

WILLIAM F. LAGRANGE, Professor of Animal Husbandry (1) 1920, 1917
B.S., Iowa State, 1917; M.S., 1928

M. REED LAMBERT, Assistant Professor of Animal Husbandry (1, 2) 1953, 1951
B.S., Utah State, 1948; M.S., 1949; Ph.D., Iowa State, 1953

ROBERT JOE LAMBERT, Assistant Professor of Mathematics (1, 6) 1953
B.A., Drake, 1943; M.S., Iowa State, 1948; Ph.D., 1951

ROBERT W. LAMSON, Assistant Professor of Physical Education for Men (1) 1957, 1949
B.S., Iowa State, 1928

WILLIAM HERVE I LANCELOT, Professor of Vocational Education (1) 1923, 1918
B.S., Iowa State, 1919; D.Ed., Miami, 1932

CARL ERIC LANGENTHOP, Associate Professor of Mathematics (1, 6) 1953, 1944
B.A., Louisville, 1943; M.S., Iowa State, 1945; Ph.D., 1948

HARVY LEE LANTZ, Associate Professor of Horticulture (2) 1946, 1916
B.S., Oregon State, 1916; M.S., Iowa State, 1918

ARNOLD L. LARSEN, Associate, Botany (3) 1957
B.A., Iowa, 1950

DALE E. LARSEN, Associate, Studio Engineer (7) 1956
THE FACULTY

JULIUS ANSGAR LARSEN, Associate Professor of Forestry (1) 1947, 1924
B.A., Yale, 1908; M.F., 1910; Ph.D., Iowa State, 1936

JEANNE ANN LARSON, Instructor in Food and Nutrition (1) 1954
B.S., Iowa State, 1938; M.S., 1956

MAURICE A. LARSON, Instructor in Chemical Engineering (1, 4) 1955, 1954
B.S., Iowa State, 1951

RUTH G. LARSON, Research Associate (8) 1955
B.S., Iowa State, 1952

WILLIAM E. LARSON, Associate Professor of Soils USDA (2) 1954, 1946
B.S., Nebraska, 1944; M.S., 1946; Ph.D., Iowa State, 1949

LAWRENCE JACKSON LASLETT, Professor of Physics (1, 8) 1951, 1946
B.S., California Institute of Technology, 1933; Ph.D., California (Berkeley), 1937

ELEANOR MAE LATHROP, Instructor in Physical Education for Women (1) 1955
B.S., Iowa, 1948

ALVAH R. LAUER, Professor of Psychology (1, 6) 1941, 1925
B.A., McPherson, 1922; M.A., Iowa, 1925; M.S., Iowa State, 1928; Ph.D., Ohio, 1929

ROGER L. LAWRENCE, Assistant Professor of Agriculture; Extension Specialist in Training (3) 1952, 1950
B.S., Ohio, 1943; M.A., George Washington, 1949

E. MILLER LAYTON, Associate (8) 1956, 1954
B.S., Union, 1954

HELEN R. LEBARON, Professor of Home Economics Research; Dean of the Division of Home Economics (1, 2) 1952
B.S., Vermont, 1932; M.S., Cornell, 1938; Ph.D., Chicago, 1946

CHESTER DANIEL LEE, Professor of Veterinary Hygiene (3) 1949, 1927
D.V.M., Iowa State, 1927; M.S., 1932

DONALD J. LEE, Instructor in Engineering Drawing (1) 1955
B.S., Iowa State, 1953

HAROLD H. LEE, SFC, Instructor in Military Science (1) 1955

SAM LEVGOLD, Professor of Physics (1, 8) 1956, 1935
B.A., Luther, 1935; M.S., Iowa State, 1936; Ph.D., 1946

THOMAS S. LEITHE, Assistant Professor of Animal Pathology (2) 1941, 1916
D.V.M., Iowa State, 1914

JOHN LEMISH, Assistant Professor of Geology (1) 1955
B.S., Michigan, 1947; M.S., 1948; Ph.D., 1955

ROY E. LEMOINE, Professor of Philosophy (1) 1949
B.S., Northwestern, 1935; S.T.B., Seabury Western Theological Seminary, 1938

ALBERT C. LEWIS, Associate (2) 1956
B.S., Iowa State, 1956

HARRIET W. LEWIS, Instructor in Textiles and Clothing (1) 1949
B.S., Iowa State, 1939; M.S., 1949

VERNON J. LIES, S/Sgt., Instructor in Air Science (1) 1956

JOHN H. LILLY, Professor of Entomology (1, 2) 1948
B.S., Wisconsin, 1931; Ph.D., 1939

FRED E. LINDBERG, Assistant Professor of Botany (1) 1950, 1947
M.S., Iowa State, 1947; Ph.D., 1949

CLARENCE H. LINDHEIM, Associate Professor of Mathematics (1) 1955, 1947
B.S., Nebraska State Teachers, 1929; M.S., Colorado, 1935; Ph.D., Iowa State, 1952

LAMBERT SIGFRED LINDEROTH, JR., Professor of Mechanical Engineering (1, 4, 6) 1949
S.B., Massachusetts Institute of Technology, 1930; M.E., Iowa State, 1950

WENDELL D. LINDSTROM, Assistant Professor of Mathematics (1) 1954, 1953
A.B., Iowa, 1949; M.S., 1951; Ph.D., 1953

*GERALD A. LINeweaver, Associate Professor of Agriculture; State Boys' 4-H Club Leader (3) 1947, 1936
B.S., Iowa State, 1929; M.S., 1949

DON A. LINGER, Instructor in Civil Engineering (1) 1956
B.S., Colorado College, 1954; M.S., New Mexico State Agricultural, 1956

DAVID A. LINE, Instructor in Agricultural Engineering (1) 1956
B.S., Cornell, 1955

CHARLES BUTTLE LIPA, Associate Professor of English (1) 1949, 1940
A.B., Cornell, 1927; A.M., 1928; Ph.D., 1940

MARGARET I. LISTON, Professor of Home Management and Head of the Department (1, 2) 1952, 1949
B.S., Iowa State, 1927; M.A., Missouri, 1933; Ph.D., Chicago, 1949

On Leave.
J ohn Wallace Litherland, Associate Professor of Vocational Education (1) 1947
A.B., Midland, 1928; M.A., Nebraska, 1937; Ph.D., 1947

Ruth Evelyn Littlefield, Assistant Professor of Child Development (1) 1955, 1950
B.S., Iowa State, 1944; M.S., 1952

Samuel H. Liu, Instructor in Electrical Engineering (1, 4) 1956
B.S., National Taiwan, 1954

William R. Lockhart, Assistant Professor of Bacteriology (1, 6) 1954
A.B., Indiana State Teachers, 1949; M.S., Purdue, 1951; Ph.D., 1954

Laurel D. Lofts Gard, Associate, Economics (3) 1956, 1955
B.S., North Dakota Agricultural, 1954

Celia M. Logsdon, Instructor in Home Economics Education (1) 1955
B.S., Iowa State, 1945

Walter Earl Loomis, Professor of Botany (1, 2) 1943, 1927
B.S., Illinois, 1921; M.S., Cornell, 1922; Ph.D., 1924

Eloise Lorch, Associate, Household Equipment (2) 1956, 1954
B.S., Kentucky, 1953; M.S., Iowa State, 1956

Fred W. Lorch, Professor of English and Head of the Department of English and Speech (1) 1942, 1921
B.A., Knox, 1918; M.A., Iowa, 1928; Ph.D., 1936

Roscoe Orrin Lorenz, Associate Professor of Architecture (1) 1951, 1944
B.A., Iowa, 1936; M.S., Iowa State, 1950

Burton Loupee, Research Associate (8) 1956
B.S., Iowa State, 1956

James E. Lovell, Assistant Professor of Veterinary Obstetrics and Radiology (1) 1956, 1953
D.V.M., Iowa State, 1946; M.S., 1955

James Allison Lowrie, Associate Professor of English (1) 1955, 1946
A.B., Lafayette College, 1935; Ph.D., Pittsburgh, 1943

Daniel C. Lu, Assistant Professor of Physics (1, 8) 1956, 1955
B.S., Yenching, 1944; Ph.D., Michigan, 1954

Rudolph John Lubsen, Associate Professor of Civil Engineering (1) 1951, 1941
B.S., Iowa State, 1930; M.S., 1932

Walter A. Lunden, Professor of Sociology (1, 6) 1948, 1947
B.A., Gustavus Adolphus, 1922; A.M., Minnesota, 1929; Ph.D., Harvard, 1934

Richard Lloyd Lundwall, Associate Professor of Veterinary Medicine and Surgery (1) 1957, 1944.
D.V.M., Iowa State, 1944; M.S., 1956

Jay Laurence Lush, Professor of Animal Husbandry (1, 2) 1930
B.S., Kansas State, 1916; M.S., 1918; Ph.D., Wisconsin, 1922

George J. Lutz, Research Associate (8) 1955
B.A., Augustana, 1953

Mary Stewart Lyle, Professor of Home Economics Education (1, 2) 1943, 1930
B.S., Purdue, 1921; M.S., Iowa State, 1924; Ph.D., Ohio, 1942

Dale Mccay, Assistant Professor of English (1) 1950, 1945
B.A., Grinnell, 1932; M.A., 1937; Ph.D., Iowa, 1953

Ray H. McClary, Instructor in Industrial Administration (1) 1956
B.S., Missouri, 1955; M.A., 1956

John Barnhart McClelland, Professor of Agricultural Education (1) 1943, 1939
B.S., Ohio, 1921; M.S., 1927; Ph.D., 1940

Gail Arlene McClure, Professor; Assistant Director of Student Health Service (1) 1955, 1938
B.S., Iowa, 1929; M.D., 1931

Lois Anne McCollough, Instructor in Mathematics (1) 1956
B.S., Iowa State, 1955

Andrew Logan McComb, Professor of Forestry (1, 2) 1946, 1932
B.S., Pennsylvania State, 1932; M.S., Iowa State, 1933; Ph.D., 1941

Glenn B. McConnell, Instructor in Engineering Drawing (1) 1956
B.S., U. S. Military Academy, 1924

Richard Duncan McConnell, Associate Professor of Architecture (1) 1953, 1947
A.B., Nebraska, 1947; M.S., Iowa State, 1950

Robert M. McCowen, Assistant Professor of Music (1) 1949
B.A., Iowa State Teachers, 1941; M.M., Northwestern, 1951

Michael A. McCoy, Instructor in Theoretical and Applied Mechanics (1) 1957, 1955
B.S., Purdue, 1955; Iowa State, 1957

Murl McDonald, Professor of Agriculture (3) 1951, 1910
B.S.A., Iowa State, 1911
THOMAS D. McGee, Assistant Professor of Ceramic Engineering (1, 4) 1956
B.S., Iowa State, 1948

DALLAS V. McGinnis, Assistant Professor; Assistant Extension Editor WOI-TV (3) 1956, 1954
B.S., Iowa State, 1943

JACK MILLER McGurn, Assistant Professor of Physical Education for Men (1) 1947, 1941
B.S., Iowa, 1933

MILDRED HICKS McHone, Instructor in Library Science and Circulation Librarian (1) 1947, 1946
B.S., Iowa State, 1933

ELAINE N. MCINTOSH, Associate, Animal Husbandry (2) 1955
A.B., Augustana, 1945; M.A., South Dakota, 1949; Ph.D., Iowa State, 1954

HARRIET T. McGlyne, Associate Professor of Textiles and Clothing (1) 1946, 1944
B.S., Iowa State, 1923; M.A., Teachers College, Columbia, 1931

JOSEPH VANCE McKEVEY, Professor of Mathematics (1) 1934, 1919
A.B., Westminster College (Pennsylvania), 1902; A.B., Cornell, 1906; Ph.D., 1909

DONALD I. McKEOwn, Assistant Professor of Architecture (1) 1955
A.B., Augustana, 1945; M.A., South Dakota, 1949; Ph.D., Iowa State, 1954

MARJORIE MARIE McKINLEY, Assistant Professor of Institution Management (1) 1947
B.S., Indiana, 1940; M.A., Teachers College, Columbia, 1946; Ph.D., Iowa State, 1956

DALE McMasters, Research Associate (8) 1956
B.A., Wabash, 1956

AMES D. McMECHAN, Instructor in Electrical Engineering (1, 6) 1955
B.S., Iowa State, 1955

THELMA JOSEPHINE McMILLAN, Associate Professor of Food and Nutrition (1) 1956, 1953
B.S., Arizona, 1940; M.S., Nebraska, 1942; Ph.D., Cornell, 1951
THE FACULTY

CLAY GEORGE MAPLE, Professor of Mathematics (1, 6) 1955, 1949
A.B., Earlham, 1939; M.A., Cincinnati, 1940; D.Sc., Carnegie Institute of Technology, 1948

BETTY LEE MARCHANT, Instructor in Child Development (1) 1955, 1954
B.S., Oklahoma A&M, 1953; M.S., Iowa State, 1955

DONALD C. MARSH, Maj., Assistant Professor of Air Science (1) 1954
B.A., Hastings College, 1941; M.A., Teachers College, Columbia, 1953

JERRY D. MARSHALL, Instructor in Mechanical Engineering (1) 1956
B.S., Iowa State, 1956

DON S. MARTIN, Professor of Chemistry (1, 8) 1955, 1946
B.S., Purdue, 1939; Ph.D., California Institute of Technology, 1944

JOHN NATHAN MARTIN, Professor of Botany (1, 2) 1917, 1911
A.B., Indiana, 1907; Ph.D., Chicago, 1913

KENNETH R. MARVIN, Professor of Technical Journalism and Head of the Department (1) 1945, 1923
B.S., Iowa State, 1923; M.S., 1938

JOHN ROY MASSEY, Professor of Government (1) 1946, 1943
A.B., Minnesota, 1925; A.M., Columbia, 1933; Ph.D., Minnesota, 1939

HOWARD MATHEWS, Research Associate (8) 1956
B.S., Iowa State, 1956

JOHN MATHEWS, JR., Research Associate (10) 1950, 1946
B.S., Iowa State, 1943; M.S., 1949

PHYLLIS CORBINE MATTHEWS, Instructor in Food and Nutrition (1) 1955
B.S., Iowa State, 1953

CLARENCE HOWEY MATTSON, Professor of History and Head of the Department of History, Government and Philosophy (1) 1945, 1939
A.B., Amherst, 1929; A.M., Harvard, 1931; Ph.D., 1936

ROY H. MATTSON, Assistant Professor of Electrical Engineering (1) 1956
B.S., Minnesota, 1951; M.S., 1952

HUGO E. MAYER, JR., Instructor in Industrial Engineering (1) 1956
B.S., Iowa State, 1953

CLINTON MEADOWS, Associate (2) 1956, 1954
B.A., Henderson State, 1935; B.S., Arkansas, 1952; M.S., Iowa State, 1955

KATHLEEN A. MEISEY, Research Associate (8) 1954
B.S., Marquette, 1954

MARY LOUISE MELKNER, Associate Professor of Applied Art (1) 1956, 1953
B.A., Milwaukee Downer College, 1938; M.A., Iowa, 1945

ROBERT M. METCALF, Professor of Dairy Husbandry (1, 2) 1950, 1949
B.S., Wilmington, 1930; M.A., Haverford, 1931; Ph.D., Cornell, 1935

HOWARD ROBERT MELDRUM, Associate Professor of Soils (2, 3) 1948, 1921
B.S., Iowa State, 1921

IRVING E. MELHUTS, Professor of Botany (1) 1952, 1916
B.S., Iowa State, 1906; Ph.D., Wisconsin, 1912

LOUIS E. MENTZ, Professor of Physical Education for Men and Head of the Department (1) 1945, 1928
B.S., Central Missouri State Teachers, 1924

IVAL A. MERCHANT, Professor of Veterinary Hygiene and Bacteriology; Dean of the Division of Veterinary Medicine; Director of Veterinary Medicine Research Institute; Assistant Director of Agricultural Experiment Station (1, 2, 10) 1956, 1925
D.V.M., Colorado State, 1924; M.S., Iowa State, 1928; Ph.D., 1933; C.P.H., Yale, 1934

MORRIS H. MERRICK, Assistant Professor of Electrical Engineering (1, 4) 1956, 1953
B.S., Iowa State, 1947; M.S., 1956

DARREL S. METCALF, Professor of Farm Crops; Assistant Director of Student Affairs (1, 2) 1956, 1946
B.S., Wisconsin, 1941; M.S., Kansas State, 1942; Ph.D., Iowa State, 1950

DAVID EVERETT METZLER, Associate Professor of Chemistry (1, 2, 6) 1957, 1953
B.S., California Institute of Technology, 1948; M.S., Wisconsin, 1950; Ph.D., 1952

DUANE IVAN MIECHELEN, Research Associate (8) 1954
B.S., Iowa State, 1951

TERRIE MICHELSONS, Instructor in Modern Languages (1) 1955

JACK L. MICKES, Instructor in Civil Engineering (1, 4) 1955, 1952
B.S., Iowa State, 1952; M.S., 1955

BLANCHE ROSE MILLER, Assistant Professor of Home Economics Education (1) 1949, 1946
B.S., Iowa State, 1933; M.S., 1945

ENID MABEL MILLER, Instructor in Physical Education for Women (1) 1956
B.A., Iowa State Teachers, 1952
THE FACULTY

MADGE MILLER, Professor of Food and Nutrition (1, 2) 1956, 1939
B.S., Iowa State, 1939; M.S., 1941; Ph.D., 1954

PHILIP R. MILLER, Associate, News Editor WOI-TV (7) 1955
B.A., Iowa, 1948

ROBERT J. MILLER, Associate, Soils (2) 1954
B.S., Illinois, 1954; M.S., 1956

ROGER E. MILLER, Research Associate (8) 1957, 1954
B.S., Morningside, 1951; M.S., Iowa State, 1957

WILLIAM W. MILLER, 1st Lt., Assistant Professor of Military Science (1) 1955
B.S., Michigan State, 1952

PHILIP R. MILLER, Associate, News Editor WOI-TV (7) 1955
B.A., Iowa, 1948

ROBERT J. MILLER, Associate, Soils (2) 1954
B.S., Illinois, 1954; M.S., 1956

ROGER E. MILLER, Research Associate (8) 1957, 1954
B.S., Morningside, 1951; M.S., Iowa State, 1957

WILLIAM W. MILLER, 1st Lt., Assistant Professor of Military Science (1) 1955
B.S., Michigan State, 1952

BERNARD M. MCCORMICK, Assistant Professor of Child Development (3) 1954
B.A., Puget Sound College, 1936; M.S., Oregon State, 1939

ARTHUR E. MOLLIN, Associate (2) 1955
B.S., Iowa State, 1932

WILLIAM SEASTREAM MOLLUX, Professor of Veterinary Pathology, Iowa Veterinary Medical Diagnostic Laboratory (1) 1953
D.V.M., Georgia, 1955

BUENA M. MOCKMORE, Assistant Professor of Child Development (3) 1954
B.A., Puget Sound College, 1936; M.S., Oregon State, 1939

ARTHUR E. MOLLIN, Associate (2) 1955
B.S., Iowa State, 1932

V. ALTON MOODY, Associate Professor of History (1) 1930, 1925
A.B., Meridian, 1912; M.A., Tulane, 1913; Ph.D., Michigan, 1923

MARIAN E. MOORE, Associate Professor of Food and Nutrition (1) 1954, 1952
B.S., Michigan State, 1931; S.M., Chicago, 1947; Ph.D., Cornell, 1952

WILEY BURTON MOORE, Assistant Professor of Physical Education for Men (1) 1947
A.B., Westminster (Fulton, Missouri), 1928; M.S., Drake, 1955

ROBERT B. MOORMAN, Assistant Professor of Zoology and Entomology (1, 3) 1956, 1939
B.S., Iowa State, 1939; M.S., 1942; Ph.D., 1953

JAMES L. MORE, Capt., Assistant Professor of Air Science (1) 1955
M.S., Southern California, 1953

VILAS JAY MORFORD, Professor of Agricultural Engineering and Vocational Education (1, 2) 1947, 1944
B.Sc., Nebraska, 1925; B.Sc., 1933

BARTON MORGAN, Professor of Vocational Education (1) 1950, 1923
B.S., Missouri State Teachers, 1919; M.S., Iowa State, 1922; Ph.D., Iowa, 1934

PAUL EMERSON MORGAN, Assistant Professor of Civil Engineering (1) 1953
B.S., Iowa State, 1944; M.S., 1956

HELEN C. MORGAL, Associate, Home Economics (3) 1955, 1942
B.S., Coe, 1916; M.S., Iowa State, 1928

EULA FRANCES MORRIS, Associate, Home Economics Research (2) 1956
B.S., Kansas State, 1929; M.S., 1946

WILLIAM MORTON, Associate, Staff Artist, Publications Office (7) 1957

CAMPBELL C. MOSER, Assistant Professor of Statistics (1, 9) 1947, 1946
B.S., Iowa State, 1944

CARL R. MOXON, Capt., Assistant Professor of Air Science (1) 1956
A.B., Michigan, 1948; M.B.A., 1950

ROBERT L. MOYER, Instructor in Industrial Engineering (1) 1956
B.S., Parsons, 1953

ROBERT C. MULHALL, Assistant Professor; General Manager WOI AM-FM-TV (7) 1956, 1943
B.A., Loras, 1943

ELMER L. MUNGER, Assistant Professor of Theoretical and Applied Mechanics (1) 1956, 1936
B.S., Kansas State, 1936; M.S., 1938

GORDON F. MUNSON, Associate, Information Assistant (7) 1945
B.A., Minnesota, 1937; M.S., 1956

GLENN MURPHY, Professor of Theoretical and Applied Mechanics and Head of the Department (1, 4, 8) 1955, 1932
B.S., Colorado, 1929; M.S., 1930; M.S., Illinois, 1932; Ph.D., Iowa State, 1935; C.E., Colorado, 1937
THE FACULTY

HICKMAN CHARLES MURPHY, Professor of Farm Crops and Botany (1, 2) 1950, 1926
B.S., West Virginia, 1926; M.S., Iowa State, 1927; Ph.D., 1930

WILLIAM G. MURRAY, Professor of Economics (1, 2) 1944, 1925
B.A., Coe, 1924; M.A., Harvard, 1925; Ph.D., Minnesota, 1932

GOPALA K. MURTHEY, Associate, Dairy Industry (2) 1956
B.S., Mysore (India), 1944; M.S., Illinois, 1953; Ph.D., 1956

WAYNE A. MUTH, Lieut. J.G., Assistant Professor of Naval Science (1) 1957
B.S., Colorado, 1934

JAMES A. MYERS, Assistant Professor of Physical Education for Men (1) 1957
B.S., Tennessee, 1947

ROBERT M. NADY, Assistant Professor of Civil Engineering (1, 4) 1955, 1952
B.S., Iowa State, 1949; M.S., 1952

JANET LOUISE NAVIN, Assistant Professor of Applied Art (1) 1954, 1951
B.F.A., Syracuse, 1948; M.S., Iowa State, 1952

FLOYD WILLIAM NELSON, Field Instructor in Firemanship Training (5) 1951

FRANK EUGENE NELSON, Professor of Dairy Industry and Bacteriology (1, 2) 1943, 1934
B.S., Minnesota, 1932; M.S., 1934; Ph.D., Iowa State, 1936

LINDA JEAN NELSON, Instructor in Home Management (1) 1957
B.S., Pennsylvania, 1950; M.S., Iowa State, 1953

MERLENE ELMA NELSON, Assistant Professor of Home Economics Education (1) 1953, 1948
B.S., Iowa State, 1931; M.S., 1950

P. MABEL NELSON, Dean Emeritus, Division of Home Economics; Professor of Food and Nutrition (1) 1952, 1923
B.S., California (Berkeley), 1915; M.A., 1916; Ph.D., Yale, 1923

JOSEPH E. NETT, Maj., Assistant Professor of Military Science (1) 1957
B.S., United States Military Academy, 1943

HAROLD J. NICHOLS, Assistant Professor of Physical Education for Men (1) 1953
B.S., Michigan, 1940; M.S., Illinois, 1946; Ph.D., Michigan, 1957

HARRY ESMOND NICHOLS, Professor of Horticulture (1) 1948, 1918
B.S., Iowa State, 1917; M.S., 1931

RAYMOND P. NICHOLSON, Assistant Professor of Agronomy (2, 3) 1956, 1948
B.S., Colorado State, 1948

DONALD R. NIELSEN, Associate, Soils (2) 1956, 1954
B.S., Arizona, 1953; M.S., 1954

DUANE M. NIELSEN, Instructor in Vocational Education (1) 1955
B.S., Nebraska, 1949; M.S., 1955

VERNER HENRY NIelsen, Associate Professor of Dairy Industry (1, 3) 1954, 1932
B.S., Iowa State, 1943; Ph.D., 1953

ILIZA LOUISE NIEMACK, Associate Professor of Music (1) 1948, 1935
Cer. Chicago Musical College, 1919

JAMES WILLIAM NILSSON, Assistant Professor of Electrical Engineering (1, 4) 1952, 1948
B.S., Iowa, 1948; M.S., Iowa State, 1952

SIDNEY D. NOLLE, Instructor in Mathematics (1) 1955
B.A., Simpson, 1948; M.S., Iowa, 1951

JOHN A. NORDIN, Professor of Agricultural Economics in charge of Instruction (1, 2, 6)
1953, 1941
B.A., Minnesota, 1935; M.A., 1937; Ph.D., 1941

ARNE W. NORDSKOG, Professor of Poultry Husbandry (1, 2) 1954, 1945
B.S., Minnesota, 1937; M.S., 1940; Ph.D., 1943

JOSEPH H. NORTH, Professor and Coordinator of Radio and Television Education; Professor of Speech and Science; Supervisor Student Training (1, 7) 1956, 1936
A.B., Wisconsin, 1934; M.A., Cornell, 1936; Ph.D., 1949

DANIEL J. NORTON, Associate, Program Coordinator WOI-TV (7) 1957

ROBERT A. NORTON, Research Associate, Agricultural Engineering (2) 1956, 1941
B.S., Iowa State, 1924; B.S., Illinois, 1928

RALPH S. NOVAK, Associate Professor of Industrial Administration (1) 1953, 1948
B.S., Iowa State Teachers, 1934; M.A., Iowa, 1938; Ph.D., 1953

LEX T. NUTTY, Associate Professor of Agriculture (3) 1929, 1917
B.S.A., Iowa State, 1917

ANN V. NYGAARD, Assistant Professor of Home Economics; District Home Economics Supervisor (3) 1950, 1936
B.S., Iowa State, 1933

GRAACE MYRTLE OBERHEIM, Assistant Professor of Library Science; Head, Order and Exchange (1) 1930, 1923
A.B., Wisconsin, 1920; M.S., Columbia, 1941
THE FACULTY

EDNA O'BRYAN, Professor of Applied Art (1) 1945, 1925
Diploma, Pratt Institute, 1918; B.A., Central Missouri State Teachers, 1930

OREST E. O'BRYAN, M/Sgt., Instructor in Military Science (1) 1956

IRWIN W. OEST, Professor of Industrial Engineering (1, 5) 1956
B.S., Iowa State, 1931; M.B.A., Harvard Business School, 1935

COLEMAN A. O'FLAHERTY, Instructor in Engineering Drawing (1) 1956
B.E., National University of Ireland, 1954

WALLACE ELMER OGG, Professor of Economics (1) 1952, 1935
B.S., Iowa State, 1931; M.S., 1944; M.A., Chicago, 1948; Ph.D., 1949

J. O'SULLIVAN, Research Associate (8) 1956, 1955
B.S., Northern Michigan, 1955

EDWARD HENRY OLSEN, Professor of Theoretical and Applied Mechanics (1) 1954, 1936
B.S., Iowa State, 1926; C.E., 1936

WALLACE H. ORGELL, Assistant Professor of Entomology (1) 1957
B.S., Iowa State, 1950; M.S., 1957

KALLIOPE PAPANTONIS, Instructor in Mathematics (1) 1955
B.S., Iowa State, 1953; M.S., 1955

CHARLES PALMER, Research Associate (8) 1955

K. D. PATRICK, Instructor in Vocational Education and Agricultural Engineering (1) 1954
B.S., Iowa State, 1953; M.S., 1955

LAWTON M. PATTERSON, Professor of Architecture (1) 1951, 1946
B.F.A., Washington, 1928; B.Arch., Columbia, 1933

PERRY W. PATTERSON, Assistant Professor of English and Speech (1) 1957, 1953
B.S., Bemidji State Teachers, 1948; M.A., Denver, 1949
RALPH E. PATTERSON, JR., Associate Professor of Civil Engineering (1, 5) 1956, 1946
B.S., Iowa State, 1946

MATTIE PATTERSON, Professor of Home Economics Education (1) 1948, 1940
B.S., Washington State, 1919; M.A., Chicago, 1931; Ph.D., 1945

ROLLAND F. PAUL, County Extension Youth Assistant (3) 1957
B.S., Iowa State, 1957

DAMARIS PEASE, Associate Professor of Child Development (1, 2) 1956, 1953
B.S., Ohio, 1944; M.S., 1946; Ph.D., Cornell, 1953

WILLIAM PECHIN, Research Associate (8) 1956
B.S., Purdue, 1956

NANCY ANN PECK, Instructor in Food and Nutrition (1) 1956
B.S., Iowa State, 1956

JOHN THOMAS PESEK, Associate Professor of Soils (2) 1952, 1950
B.S., Texas A&M, 1943; M.S., 1947; Ph.D., North Carolina State, 1950

CHRISTIAN PETERSEN, Associate Professor of Applied Art (1) 1944, 1937
M.S., Iowa State, 1947

ALDO CORNELIUS PETERSON, Associate Professor of Theoretical and Applied Mechanics (1) 1957, 1938
B.S., Iowa State, 1926; M.S., 1941

DAVID PETERSON, Assistant Professor of Chemistry (1, 8) 1951, 1942
B.S., Iowa State, 1947; Ph.D., 1950

DONALD G. PETERSON, Associate, Chief Announcer WOI-TV (7) 1953

EDWIN WILLIAM PETERSON, Assistant Professor of Government (1) 1950, 1946
A.B., Grinnell, 1918; A.M., Iowa, 1926

JAMES D. PETERSON, Instructor in Firemanship Training (1, 5) 1956

LEONARD D. PETERSON, Instructor in Theoretical and Applied Mechanics (1) 1957
B.S., Iowa State. 1954

LEWIS E. PETERSON, Associate, Horticulture (2, 3) 1946
B.S., Iowa State, 1937

PAUL W. PETERSON, Assistant Professor of Theoretical and Applied Mechanics (1, 4) 1956, 1946
B.S., Iowa State, 1946; M.S., 1948; Ph.D., 1957

PETER A. PETERSON, Assistant Professor of Genetics (1, 2) 1956
B.S., Tufts, 1947; Ph.D., Illinois, 1953

HARRY H. PHILLIPS, Lieut. J.G., Assistant Professor of Naval Science (1) 1956
A.B., North Carolina, 1954

JOE A. PHILLIPS, Associate, Soils (2) 1956, 1955
B.S., Tennessee, 1951

RICHARD PHILLIPS, Associate Professor of Economics (2, 3) 1955, 1949
B.S., Iowa State, 1948; M.S., 1949; Ph.D., 1952

ROBERT E. PHILLIPS, Professor of Poultry Husbandry and Head of the Department (1, 2, 3) 1946, 1938
B.S., Kansas State, 1935; M.S., 1936; Ph.D., Iowa State, 1941

ROBERT F. PHILLIPS, Associate, Studio Operations Assistant WOI-TV (7) 1953

JOSEPH C. PIOKEN, JR., Associate Professor of Veterinary Physiology (10) 1951, 1939
B.S., Iowa State, 1939; Ph.D., 1947

BETHEL STEWART PICKET, Professor of Horticulture (2) 1947, 1923
B.S.A., Toronto, 1904; M.S., Illinois, 1906

JOHN B. PIEPER, S/Sgt., Instructor in Air Science (1) 1954

WILLIAM HENRY PIERRE, Professor of Agronomy and Head of the Department (1, 2, 3) 1938
B.S., Wisconsin, 1921; M.S., 1923; Ph.D., 1925

BETHEL STEWART PICKET, Professor of Horticulture (2) 1947, 1923
B.S.A., Toronto, 1904; M.S., Illinois, 1906

JOHN B. PIEPER, S/Sgt., Instructor in Air Science (1) 1954

WILLIAM HENRY PIERRE, Professor of Agronomy and Head of the Department (1, 2, 3) 1938
B.S., Wisconsin, 1921; M.S., 1923; Ph.D., 1925
Frank Arthur Pierson, Assistant Professor of Music (1) 1948
B.A., Grinnell, 1933; M.A., Iowa, 1943

Robert R. Pinceres, Assistant Professor; State Youth Leader (3) 1956
B.S., Ohio, 1940; M.A., Minnesota, 1957

Louis Erwin Pinney, Associate Professor of Physics (1) 1945, 1930
A.B., Missouri, 1925; A.M., 1927; Ph.D., Chicago, 1942

Herbert John Plagge, Associate Professor of Physics (1) 1918, 1909
B.S., Northwestern, 1906; M.A., Wisconsin, 1910

Richard W. Poel, Professor of Botany; Curator of the Herbarium (1, 2, 6) 1956, 1947
B.S., Marquette, 1939; Ph.D., Pennsylvania, 1947

Julie Anne Poelrot, Instructor in Science (1) 1957
B.S., Missouri, 1954; M.S., Iowa State, 1957

Margaret Ruth Polson, Instructor in Applied Art (1) 1956
B.F.A., Cornell, 1954; M.S., Cornell, 1956

Julia Yost Quinn, Associate Professor of Bacteriology and Acting Head of the Department (1, 6) 1957, 1949
B.S., Purdue, 1941; M.S., 1947; Ph.D., 1950

Jerry M. Rakes, Associate, Dairy Husbandry (2) 1956
B.S., Arkansas, 1954; M.S., 1956

Frank Kenneth Ramsey, Professor of Veterinary Pathology and Head of the Department (1) 1957, 1943
B.S., Northern State Teachers, 1936; M.A., Montana, 1940; D.V.M., Iowa State, 1946; Ph.D., 1953

Lantis Ratcliff, Associate, Dairy Husbandry (2) 1955
B.S., Mississippi State, 1942; M.S., Texas A&M., 1950

Wayne Barrett Ratterree, Assistant Professor of Theoretical and Applied Mechanics (1) 1953
B.S., Georgia Institute of Technology, 1936; M.S., 1949

Earl S. Raun, Assistant Professor of Entomology (3) 1953, 1948
B.S., Iowa State, 1946; M.S., 1950; Ph.D., 1954

Alvin A. Read, Assistant Professor of Electrical Engineering (1, 4) 1955, 1949
B.S., Iowa State, 1949; M.S., 1952

Charles Steven Reddy, Professor of Botany (1, 2) 1950, 1927
B.S., Wisconsin, 1915; M.S., 1916; Ph.D., 1922

Marion G. Reed, Associate, Agronomy 1957
B.S., Iowa State, 1957

Woodrow W. Reed, Assistant Professor of Psychology (1) 1956
A.B., Berea, 1947; Ph.D., Nebraska, 1955

Joachim Rexer, Research Associate (8) 1952
B.A., Brooklyn, 1952

Wayne Reinhart, Research Associate (8) 1950
B.S., Iowa State, 1950

Anta Rice, Instructor in Textiles and Clothing (1) 1954
B.S., Illinois, 1948; M.S., 1950

John Joseph Richard, Research Associate (8) 1954
B.S., Loras, 1954

Marlene Joan Richard, Research Associate (8) 1954
B.S., South Dakota State, 1954
<table>
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<tr>
<th>Name</th>
<th>Position</th>
<th>Years</th>
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<tbody>
<tr>
<td>Dale O. Richards</td>
<td>Instructor in Industrial Engineering</td>
<td>(1) 1955</td>
</tr>
<tr>
<td>Glenn Arthur Richardson</td>
<td>Associate Professor of Electrical Engineering</td>
<td>(1, 6) 1952, 1947</td>
</tr>
<tr>
<td>Frank F. Reckeen</td>
<td>Professor of Soils</td>
<td>(1, 2) 1947, 1942</td>
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<tr>
<td>Jean Miriam Rigos</td>
<td>Assistant Professor of Institution Management</td>
<td>(1) 1956</td>
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<tr>
<td>Dale O. Richards</td>
<td>Instructor in Industrial Engineering</td>
<td>(1) 1955</td>
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<tr>
<td>Glenn Arthur Richardson</td>
<td>Associate Professor of Electrical Engineering</td>
<td>(1, 6) 1952, 1947</td>
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<tr>
<td>Frank F. Reckeen</td>
<td>Professor of Soils</td>
<td>(1, 2) 1947, 1942</td>
</tr>
<tr>
<td>James Sinclair Rising</td>
<td>Professor of Engineering Drawing and Head of the Department</td>
<td>(1) 1951</td>
</tr>
<tr>
<td>Carol Rittgers</td>
<td>Instructor in English and Speech</td>
<td>(1) 1956</td>
</tr>
<tr>
<td>James D. Riley</td>
<td>Assistant Professor of Mathematics</td>
<td>(1) 1955</td>
</tr>
<tr>
<td>Harriet Roberts</td>
<td>Assistant Professor of Food and Nutrition</td>
<td>(3) 1952, 1942</td>
</tr>
<tr>
<td>Fred Robertson</td>
<td>Assistant Professor of Mathematics</td>
<td>(1) 1943, 1927</td>
</tr>
<tr>
<td>Joseph L. Robinson</td>
<td>Professor of Farm Crops</td>
<td>(2, 3) 1946, 1920</td>
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<td>Pierre G. Robinson</td>
<td>Associate Professor of Mathematics</td>
<td>(1) 1930, 1922</td>
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<td>Frank Roota</td>
<td>Professor of Economics</td>
<td>(1, 2, 3) 1937, 1920</td>
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<td>Charlotte Elizabeth Roderuck</td>
<td>Professor of Food and Nutrition</td>
<td>(1, 2) 1954, 1948</td>
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<td>Howard A. Rogers</td>
<td>SFC, Instructor in Military Science</td>
<td>(1) 1954</td>
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<td>Milton Lander Rognness</td>
<td>Assistant Professor of Engineering Drawing</td>
<td>(1) 1955, 1940</td>
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<td>Basilio Rojas</td>
<td>Associate, Statistics</td>
<td>(2) 1956</td>
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<td>Paul F. Romberg</td>
<td>Associate Professor of Botany</td>
<td>(1, 2) 1956</td>
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<td>Winfield S. Rosenberger</td>
<td>Assistant Professor of Dairy Industry</td>
<td>(1) 1946</td>
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<td>Louise M. Rosenfeld</td>
<td>Professor of Home Economics; Assistant Director of Home Economics Extension</td>
<td>(3) 1950, 1932</td>
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<td>Burton J. Ross</td>
<td>Assistant Professor of Military Science</td>
<td>(1) 1956</td>
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<td>Earle Dudley Ross</td>
<td>Professor of History</td>
<td>(1) 1943, 1923</td>
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<td>Ralph Rudolph Rothacker</td>
<td>Professor of Landscape Architecture</td>
<td>(1) 1952, 1922</td>
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<td>Walter Christopher Rothenebeler</td>
<td>Assistant Professor of Zoology and Entomology</td>
<td>(1, 2) 1954, 1950</td>
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<td>Malcolm A. Rougvie</td>
<td>Assistant Professor of Physics</td>
<td>(1, 8) 1957, 1955</td>
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<td>Robert Richard Rounsley</td>
<td>Instructor in Chemical Engineering</td>
<td>(1) 1954</td>
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<td>Ralph Rudolph Rothacker</td>
<td>Professor of Landscape Architecture</td>
<td>(1) 1952, 1922</td>
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<td>Keith Royer</td>
<td>Chief Instructor in Firemanship Training</td>
<td>(5) 1951</td>
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<td>Warren L. Royer</td>
<td>Associate, Film Director WOL-TV</td>
<td>(7) 1955</td>
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<td>Marshall F. Ruchte</td>
<td>Assistant Professor of Mathematics</td>
<td>(1) 1957</td>
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ARTHUR W. RUDNICK, Professor of Dairy Industry (3) 1918, 1913
B.S., Iowa State, 1910

KLAUS RUDELBEN, Assistant Professor of Chemistry (1, 8) 1955, 1950
M.S., Fribourg, Switzerland, 1944; Ph.D., Zurich, 1950

ROBERT E. RUNDLE, Professor of Chemistry and Physics (1, 6, 8) 1946, 1941
B.S., Nebraska, 1937; M.S., 1938; Ph.D., California Institute of Technology, 1941

WILBERT A. RUSSELL, Associate Professor of Farm Crops (2) 1955, 1952
B.S.A., Manitoba, 1942; M.S., Minnesota, 1947; Ph.D., 1952

BURNS M. SABEY, Instructor in Soils (1) 1954, 1953
B.S., Brigham Young, 1953; M.S., Iowa State, 1954

JANE SADLER, Associate Professor of Textiles and Clothing (1) 1955, 1944
B.Ed., Illinois State Normal, 1933; M.S., Iowa State, 1945

CHARLES G. SANDERS, Assistant Professor of Engineering Drawing (1) 1951, 1949
B.A., Iowa State Teachers, 1947; M.A., Colorado State, 1949

DONALD E. SANDERSON, Assistant Professor of Mathematics (1) 1954, 1953
B.A., Cornell College, 1949; M.S., California Institute of Technology, 1951; Ph.D., Wisconsin, 1953

JOHN FREDERICK SANDFORD, Professor of Mechanical Engineering (1) 1956, 1939
B.M.E., Ohio, 1933; B.I.E., 1934; M.S., Iowa State, 1948

JOHN EUGENE SASS, Professor of Botany (1, 2) 1949, 1928
B.S., Michigan, 1924; M.S., 1925; Ph.D., 1922

DONALD S. SASSER, Instructor in Theoretical and Applied Mechanics (1) 1955
B.S., Utah, 1953

CARL J. SAYRE, Instructor in Engineering Drawing (1) 1956
B.S., Iowa State, 1949

JOANNE R. SCANTLAN, Instructor in Library Science and Cataloger (1) 1955
B.S., College of St. Catherine, 1955

RILEY SCHAFFER, Associate Professor of Chemistry (1, 6, 8) 1956, 1952
B.S., Chicago, 1946; Ph.D., 1949

FRANK W. SCHALLER, Associate Professor of Soils (3) 1949
B.S., Wisconsin, 1937; M.S., Wisconsin, 1940; Ph.D., 1948

MONNA JEAN SCHAPER, Instructor in Child Development (1) 1954
B.A., Kansas State, 1952; M.S., North Carolina, 1955

RALPH F. SCHAUEER, Instructor in Electrical Engineering (1, 4) 1955
B.S., Iowa State, 1952

CLETUS E. SCHERTZ, Instructor in Theoretical and Applied Mechanics (1) 1957
B.S., Illinois, 1954

JULIAN C. SCHILLINGER, Professor of Horticulture; Director of Residence 1945, 1922
B.S., Clemson, 1922; M.S., Iowa State, 1923; Ph.D., 1930

JOHN T. SCHILLER, Assistant Professor of History (1) 1956

FREDERICK A. SCHMIDT, Research Associate (8) 1951
B.S., Xavier, 1951

HARRY J. SCHMIDT, Professor of Physical Education for Men (1) 1955, 1926
B.S., Iowa State, 1925; M.A., Iowa, 1929

LOUIS BERNARD SCHMIDT, Professor Emeritus of History (1) 1952, 1906
Ph.B., Cornell College, 1901; A.M., 1906; Litt.D., 1934

FLORENCE SCHOFIELD, Associate, Food and Nutrition (2) 1952
B.S., Nebraska, 1917; M.A., Columbia, 1926

JESSE M. SCHOLL, Associate Professor of Farm Crops (2) 1949
B.S., Wisconsin, 1945; M.S., 1944; Ph.D., 1947

WAYNE HENRY SCHOLTZ, Professor of Soils (1, 2) 1955, 1946
B.S., Iowa State, 1939; M.S., Duke, 1940; Ph.D., Iowa State, 1951

WILLIAM H. SCHEMPP, Professor of Industrial Administration and Head of the Department (1, 2) 1955, 1929
B.A., Iowa, 1926; J.D., 1928

IRA SCHROEDER, Associate Professor of Music (1) 1948, 1931
B.Mu., Bush Conservatory of Music, 1927

HELEN L. SCHULZ, Instructor in English (1) 1942, 1926
B.S., Iowa State, 1926; M.S., 1945

JOHN A. SCHULZ, Assistant Professor of Chemistry (1, 2) 1931, 1921
B.S., Illinois, 1917; M.S., Iowa State, 1927

LOUIS HAROLD SCHWARTZ, Professor of Veterinary Pathology (10) 1945, 1925
B.S., Cornell, 1918; M.S., 1920; D.V.M., Iowa State, 1928; Ph.D., 1934

FREDERICK SCHWARTZ, Associate Professor of Modern Languages (1) 1955, 1946
B.A., Iowa, 1935; M.A., 1936; Ph.D., 1948
JAMES W. SCHWARTZ, Assistant Professor of Technical Journalism (1) 1945
B.S., Iowa State, 1941.

EARL J. SCHWEPPF, Assistant Professor of Mathematics (1) 1957
B.S., Missouri Valley, 1948; M.S., Illinois, 1951; Ph.D., 1955.

ALBERT DUNCAN SCOTT, Associate Professor of Soils (1, 2) 1953, 1950
B.S.A., Saskatchewan, 1943; Ph.D., Cornell, 1949.

J. T. SCOTT, Instructor in Economics (1) 1955

RICHARD M. SEABURY, Associate Professor of Mathematics (1) 1948, 1942

EMMA JEAN SELBY, Assistant Professor of Home Economics Education (1) 1955, 1954
B.S., Kansas State, 1946; M.S., Iowa State, 1955.

JOSEPH H. SENNE, Jr., Assistant Professor of Civil Engineering (1) 1954
B.S., Washington (St. Louis), 1948; M.S., Missouri School of Mines and Metallurgy, 1951.

GEORGE K. SEROV, Assistant Professor of Mechanical Engineering (1, 4) 1953, 1948
B.S., Iowa State, 1948; M.S., 1950.

O. SEITLES, Associate Professor of Textiles and Clothing (1) 1924, 1923
B.S., Kansas State University, 1920; M.S., Columbia, 1920.

THEODORE E. SEXAUER, Professor of Vocational Education (1) 1954, 1928
B.S., Iowa State, 1929; B.S., 1918; M.S., 1918; M.A., Columbia, 1926; Ph.D., Cornell, 1928.

HARRY L. SHADLE, Associate Professor of Industrial Administration (1) 1955, 1949
B.S., Simpson, 1934; M.A., Iowa, 1940; Ph.D., 1954.

ELLSWORTH R. SHAFFER, Assistant Engineer, WOI-AM-FM (7) 1956

NAOMI DOROTHY SHANK, Associate Professor of Home Management (3) 1953, 1945
B.S., Iowa State, 1945.

ROBERT A. SHARPE, Assistant Professor of Electrical Engineering (1) 1956, 1954

FREDERICK VAN TICE SHATTUCK, Professor of Speech (1) 1916, 1907
B.A., University of Wisconsin, 1905.

ROBERT H. SHAW, Associate Professor of Agricultural Climatology (1, 2) 1949, 1941
B.S., Iowa State, 1941; M.S., 1942; Ph.D., 1949.

PHILOAS S. SHEARER, Professor of Animal Husbandry (1, 2) 1954, 1912
B.S., Iowa State, 1912; M.S., 1928.

JOHN B. SHEELEY, Assistant Professor of Civil Engineering (1, 4) 1956, 1951
B.S., Iowa State, 1950; Ph.D., 1956.

GEOFFREY SEDDON SHEPPARD, Professor of Agricultural Economics (1, 2) 1943, 1927
B.S., Saskatchewan, 1924; M.S., Iowa State, 1925; Ph.D., Harvard, 1932.

ALBERT MARLIN SHEPP, Instructor in Vocational Education (1) 1953, 1952

CHARLES H. SHERWOOD, Assistant Professor of Horticulture (2, 3) 1949, 1941
B.S., Iowa State, 1952; M.S., Ohio, 1941.

*EMERSON WAYNE SHIDLER, Associate Professor of Philosophy (1) 1956, 1950
A.B., Pittsburgh, 1937; B.D., Chicago Theological Seminary, 1940; Ph.D., Chicago, 1948.

HOWARD E. SHEERAKER, Research Associate (8) 1956, 1954
A.B., Wichita, 1953; M.S., Iowa State, 1957.

ROBERT N. SHOFFNER, Professor of Poultry Husbandry (1, 2) 1957
B.S., Kansas State, 1940; M.S., Minnesota, 1942; Ph.D., 1946.

KATHERINE J. SHERLEN, Associate (2) 1955

WILLIAM D. SHERREDER, Associate Professor of Soils (2) 1954, 1950
B.S., Missouri, 1935; M.A., 1941; Ph.D., Iowa State, 1953.

MALCOLM C. SHURTEFF, Jr., Assistant Professor of Botany (1, 2, 3) 1954
B.S., Rhode Island, 1943; M.S., Minnesota, 1930; Ph.D., 1953.

PAUL SIDLES, Research Associate (8) 1951, 1948
B.A., Iowa Wesleyan, 1948; M.S., Iowa State, 1951.
THE FACULTY

LAWRENCE K. SIECK, Instructor in Civil Engineering (1) 1955, 1953
B.S., Iowa State, 1947; M.S., 1956

CLIFFORD M. SIMON, Associate Professor; Associate Bulletin Editor, Publications Office
B.S., Iowa State, 1932

MARR D. SIMONS, Associate Professor of Botany, (1, 2) 1955, 1950
B.S., Utah State, 1949; M.S., 1950; Ph.D., Iowa State, 1952

GERALD H. SIMONSON, Associate, Agronomy (2) 1956, 1955
B.S., Minnesota, 1951; M.S., 1953

WILLIAM R. SIMPSON, Field Instructor Firemanship Training (5) 1955

WILLIS H. SKIDLA, Professor of Farm Crops (1, 2) 1957
B.S., Nebraska, 1941; Ph.D., Purdue, 1949

BERNARD JAMES SLATER, Assistant Professor of Architecture (1) 1953, 1947
B.Arch., Notre Dame, 1946; M.S., Iowa State, 1953

MARGARET W. SLOSS, Assistant Professor of Veterinary Pathology (1) 1943, 1923
B.S., Iowa State, 1923; M.S., 1932; D.V.M., 1938

CHARLES M. SMIT, Associate, Agronomy (2) 1953, 1952
B.S., Iowa State, 1947; M.S., 1954; Ph.D., 1956

CLIFFORD E. SMITH, Instructor in Industrial Engineering (1) 1957
B.S., Iowa State, 1949

E. MARJORIE SMITH, Instructor in Library Science and Cataloger (1) 1953
B.A., Iowa State Teachers, 1932; M.A., Denver, 1950

EDNA EDELAND SMITH, Associate; Information Assistant (7) 1953
A.B., South Dakota, 1953

EDWIN RAYMOND SMITH, Professor of Mathematics (1) 1921
A.B., Illinois, 1905; A.M., Wisconsin, 1908; Ph.D., Munich, 1911

FREDERICK G. SMITH, Professor of Botany and Chemistry (1, 2) 1956, 1948
B.S., Chicago, 1939; M.S., Wisconsin, 1941; Ph.D., 1943

GERALD W. SMITH, Instructor in Industrial Engineering (1) 1956
B.S., Iowa State, 1952

GERTRUDE C. SMITH, Associate; District Home Economics Supervisor (3) 1955, 1930
B.S., Iowa State, 1930

HELEN FLORENCE SMITH, Assistant Professor of Mathematics (1) 1945, 1907
A.B., Cornell, 1902; M.S., Iowa State, 1921

J. F. DOWNIE SMITH, Dean of the Division of Engineering; Director of the Engineering
Experiment Station and Engineering Extension Service, 1947
B.Sc., Glasgow, 1923; M.Sc., Georgia School of Technology, 1925; M.E., Virginia Polytechnic
Institute, 1928; S.M., Harvard, 1930; Sc.D., 1933

JAMES D. SMITH, Instructor in Genetics (1) 1957, 1954
B.S., Iowa State, 1950; M.S., 1956

JOHN F. SMITH, Assistant Professor of Chemistry (1, 8) 1955, 1948
B.A., Kansas City, 1948; Ph.D., Iowa State, 1953

LESLIE WALTERS SMITH, Associate Professor of Food and Nutrition (3) 1954, 1951
B.S., South Dakota State, 1929; M.S., Iowa State, 1952

LEWIS T. SMITH, Associate, Poultry Husbandry (2) 1957
B.S., Rhode Island, 1950; M.S., North Carolina State, 1953

SHIRLEY-JEAN SMITH, Associate, Textiles and Clothing (3) 1955
B.S., New York State University Teachers, 1951; M.S., Iowa State, 1955

WAYNE E. SMITH, Instructor in Veterinary Medicine and Surgery (1) 1956
D.V.M., Colorado A&M., 1936

MORTON SMUTZ, Professor of Chemical Engineering and Head of the Department (1, 4, 8)
1955, 1951
B.S., Kansas State, 1940; M.S., 1941; Ph.D., Wisconsin, 1950

GEORGE WADDEL SNEDER, Professor of Statistics (1, 2, 9) 1947, 1913
B.S., Alabama, 1905; M.A., Michigan, 1913

JOHN M. SOILEAU, Associate, Soils (2) 1956
B.S., Southwestern Louisiana Institute, 1956

MAURICE WILLIAM SOULTS, Associate Professor of Agriculture; Assistant Director of the
Agricultural and Home Economics Extension Service (3) 1946, 1933
B.S., Iowa State, 1930

MERLIN G. SPANGLER, Professor of Civil Engineering (1, 4) 1947, 1924
B.S., Iowa State, 1919; C.E., 1926; M.S., 1928

DALE SPARKE, Instructor in Electrical Engineering (1) 1956
B.S., Iowa State, 1953

MAYNARD LYNN SPEAR, Assistant Professor of Veterinary Medicine (3) 1951
D.V.M., Iowa State, 1931
FRANK H. SPEDDING, Professor of Chemistry and Physics; Director of the Institute for Atomic Research; Director of the Ames Laboratory AEC (1, 8) 1942, 1937
B.S., Michigan, 1923; M.S., 1926; Ph.D., California, 1929; LL.D., Drake, 1946; D.Sc. Michigan, 1949; D.Sc., Case Institute of Technology, 1956

JOHN F. SPEER, Associate Professor of English (1) 1956, 1950
A.B., Oregon, 1946; A.M., 1947; Ph.D., Chicago, 1950

VAUGHN C. SPEER, Associate, Animal Husbandry (2) 1953
B.S., Iowa State, 1949; M.S., 1951

NEAL J. SPITZL, T/Sgt., USMC, Instructor in Naval Science (1) 1955

AMES E. SPOONER, Instructor in Engineering Drawing (1) 1956
B.S., Carnegie Institute of Technology, 1952

A. B., Arkansas, 1908; A.M., Chicago, 1922

DEAN W. STEBBINS, Professor of Physics (1, 6) 1951, 1935
B.S., Montana State, 1935; Ph.D., Iowa State, 1938

ARCH STEEL, Instructor in Physical Education for Men (1) 1954
B.S., Bowling Green, 1940; M.A., Michigan, 1947

PAUL N. STEVENSON, Assistant Professor of Agricultural Engineering (1) 1956, 1955
B.S., Missouri, 1948; M.S., Iowa State, 1956

LOWELL O. STEWART, Professor of Civil Engineering and Head of the Department (1) 1938, 1924
B.S., Michigan State, 1917; M.S., Iowa State, 1927; C.E., 1928

MELBOURNE G. STEWART, Jr., Assistant Professor of Physics (1, 8) 1956, 1955
A.B., Michigan, 1949; M.S., 1950; Ph.D., 1955

ROBERT M. STEWART, Jr., Associate Professor of Physics (1, 6) 1955, 1949
B.S., Iowa State, 1945; Ph.D., 1954

DOROTHY FRAHM STICKLER, Instructor in Food and Nutrition (1) 1955
B.S., Iowa State, 1955

HERMAN J. STOEVER, Professor of Mechanical Engineering (1) 1943, 1938
B.S., Purdue, 1928; M.S., Illinois, 1930; Ph.D., 1934

JOHN F. STONE, Research Associate, Soils (8) 1956
B.S., Nebraska, 1952; M.S., Iowa State, 1955

DAVID A. STORVICK, Assistant Professor of Mathematics (1) 1956, 1955
A.B., Luther, 1951; M.A., Michigan, 1952; Ph.D., 1956

ALBERT C. STRAUFUSS, Instructor in Veterinary Pathology and Veterinary Medical Diagnostic Laboratory (1) 1956
B.S., D.V.M., Kansas State, 1954

JAMES R. STRAIN, Assistant Professor of Economics (3) 1957
B.S., Purdue, 1950; M.S., 1955

NORMAN V. STRAND, Associate Professor of Statistics (1, 6, 9) 1950, 1935
B.S., South Dakota State, 1934; M.S., 1935

WILLIAM MATTHEW STRANNIGAN, Associate Professor of Physical Education for Men (1) 1957, 1954
B.A., Wyoming, 1942

CHARLES C. STRINGFELLOW, Capt., Associate Professor of Military Science (1) 1956
B.S., Alabama Polytechnic Institute, 1950

JOSEPH ANDREW STRITZEL, Associate, Soils (3) 1950
B.S., Iowa State, 1949; M.S., 1953

WILLIAM M. STUVE, Instructor in Botany (1) 1955, 1954
B.A., St. Ambrose, 1953

FREDERICK W. STUVE, Assistant Professor of Aeronautical Engineering (1) 1956
B.S., Texas A&M., 1947; M.S., Texas, 1952

JAY SUCRE, Instructor in Engineering Drawing (1) 1955
B.S., Iowa State, 1951
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<th>Name</th>
<th>Title/Position</th>
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<tr>
<td>Wm. M. Sullow, Research Associate</td>
<td>Psychology (6) 1953</td>
<td>B.A., Nebraska State Teachers, 1947; M.A., Iowa, 1949; M.S., Iowa State, 1953; Ph.D., 1956</td>
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<td>Carroll O. Sundre, County Extension Youth Assistant</td>
<td>(3) 1957</td>
<td>B.S., Iowa State, 1952</td>
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<td>Edith M. Sunderlin, Professor of Child Development</td>
<td>(1) 1954, 1934</td>
<td>B.S., Iowa State, 1924; M.A., Iowa, 1931</td>
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<td>Clayton Sutherland, Associate Professor of Physical Education for Men</td>
<td>(1) 1947, 1941</td>
<td>B.A., Coe, 1923</td>
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<td>William N. Sutherland, Associate</td>
<td>Soils (2) 1956, 1952</td>
<td>B.S., Iowa State, 1950; M.S., 1953</td>
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<td>Harry J. Svec, Associate Professor of Chemistry</td>
<td>(1, 6, 8) 1956, 1941</td>
<td>B.S., John Carroll, 1941; Ph.D., Iowa State, 1950</td>
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<td>Lydia V. Swanson, Professor of Child Development</td>
<td>(1) 1943, 1924</td>
<td>B.S., Nebraska, 1923; M.S., Iowa State, 1931</td>
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<td>Pearl Pauline Swanson, Professor of Food and Nutrition; Assistant Director in Charge of Home Economics Research</td>
<td>(1, 2) 1944, 1930</td>
<td>B.S., Carleton, 1916; M.S., Minnesota, 1924; Ph.D., Yale, 1930</td>
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<td>Clayton A. Swenson, Assistant Professor of Physics</td>
<td>(1, 8) 1955</td>
<td>B.S., Harvard, 1944; D.Phil., Oxford, 1949</td>
<td></td>
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<tr>
<td>Melvin J. Swenson, Professor of Veterinary Physiology and Head of the Department of Veterinary Physiology and Pharmacology</td>
<td>1957</td>
<td>D.V.M., Kansas State, 1943; M.S., Iowa State, 1947; Ph.D., 1950</td>
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<td>Russell Swenson, Assistant Professor; District Extension Supervisor</td>
<td>(3) 1956, 1949</td>
<td>B.S., Iowa State, 1949</td>
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<td>William Paul Switzer, Assistant Professor of Veterinary Hygiene</td>
<td>(2, 10) 1951, 1948</td>
<td>B.S., Texas A&amp;M., 1948; M.S., Iowa State, 1951; Ph.D., 1954</td>
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<td>Erhardt P. Sylvester, Professor of Botany</td>
<td>(1, 2, 3) 1949, 1930</td>
<td>B.A., St. Olaf, 1930; M.S., Iowa State, 1931; Ph.D., 1946</td>
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<td>Paul Clifford Taff, Professor of Agriculture</td>
<td>(3) 1950, 1908</td>
<td>B.S.A., Iowa State, 1913; L.L.D., Loras, 1949</td>
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<td>Matazo Tagami, Research Associate</td>
<td>(8) 1955</td>
<td>B.A., Mankato Teachers, 1955</td>
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<td>Victor M. Tamashunas, Instructor in Industrial Engineering</td>
<td>(1) 1956</td>
<td>B.S., Iowa State, 1950</td>
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<td>Margaretta Tarr, Associate Professor of Landscape Architecture</td>
<td>(3) 1952, 1939</td>
<td>B.S., Iowa State, 1926</td>
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<td>Donald H. Tarrant, Capt., Assistant Professor of Air Science</td>
<td>(1) 1956</td>
<td>B.S., Morningside, 1948</td>
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<td>Oscar E. Tauber, Professor of Physiology</td>
<td>(1, 2, 6) 1946, 1930</td>
<td>B.S., James Millikin, 1930; M.S., Iowa State, 1932; Ph.D., 1935</td>
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<tr>
<td>Beryl S. Taylor, Associate Professor of Physical Education for Men</td>
<td>(1) 1950, 1937</td>
<td>B.S., Illinois, 1932; M.S., 1933</td>
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<tr>
<td>Bruce R. Taylor, Associate Professor of Animal Husbandry</td>
<td>(1, 2) 1955</td>
<td>B.S., Kansas State, 1931; M.S., 1934; Ph.D., Iowa State, 1955</td>
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<tr>
<td>Howard Taylor, Associate, Statistics</td>
<td>(6) 1952</td>
<td>B.S., Akron, 1948; M.S., Iowa State, 1951</td>
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<tr>
<td>Milton E. Taylor, Instructor in Veterinary Hygiene</td>
<td>(1) 1955</td>
<td>B.S., Missouri, 1943; D.V.M., 1951</td>
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<td>Helen A. Tedford, Instructor in Child Development</td>
<td>(1) 1956, 1955</td>
<td>B.S., Rhode Island, 1954; M.S., Iowa State, 1956</td>
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<td>Lester G. Teizer, Assistant Professor of Economics</td>
<td>(1) 1955</td>
<td>B.A., Roosevelt, 1951; M.A., Chicago, 1953; Ph.D., 1956</td>
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<td>Glenn H. Teacker, Assistant Professor of Poultry Husbandry</td>
<td>(3) 1956</td>
<td>B.S., Nebraska, 1940</td>
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<td>Henry Peter Theilman, Professor of Mathematics</td>
<td>(1) 1947, 1942</td>
<td>B.A., Bluffton, 1926; M.A., Ohio, 1927; Ph.D., 1930</td>
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<tr>
<td>Wilbur C. Thombourn, Assistant Professor of Physics</td>
<td>(1, 8) 1956</td>
<td>B.S., Allegheny, 1921; A.M., Northwestern, 1922; M.S., Chicago, 1931; Ph.D., Iowa State, 1956</td>
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<tr>
<td>Byron Henry Thomas, Professor of Chemistry</td>
<td>(1, 2) 1931</td>
<td>B.S., California, 1927; M.S., Wisconsin, 1924; Ph.D., 1929</td>
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<tr>
<td>Ernest E. Thomas, County Extension Youth Assistant</td>
<td>(3) 1957, 1954</td>
<td>B.S., Iowa State, 1955</td>
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<td>Leo Almor Thomas, Professor of Geology</td>
<td>(1, 4) 1956, 1948</td>
<td>A.B., Iowa, 1940; A.M., Missouri, 1942; Ph.D., 1948</td>
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</table>
WALTER I. THOMAS, Assistant Professor of Farm Crops (1, 2) 1956, 1949
B.S., Iowa State, 1949; M.S., 1953; Ph.D., 1955

HARVEY E. THOMPSON, Associate Professor of Farm Crops (2, 3) 1954, 1950
B.S., Wisconsin, 1947; M.S., 1948; Ph.D., 1951

JAMES A. THOMPSON, Research Associate (8) 1955
B.A., St. Olaf College, 1955

LOUIS MILTON THOMPSON, Professor of Soils; Professor in Charge of Farm Operation (1)
B.S., Texas A&M., 1935; M.S., Iowa State, 1947; Ph.D., Columbia, 1941

WALTER I. THOMAS, Assistant Professor of Farm Crops (1, 2) 1956, 1949
B.S., Iowa State, 1949; M.S., 1953; Ph.D., 1955

HARVEY E. THOMPSON, Associate Professor of Farm Crops (2, 3) 1954, 1950
B.S., Wisconsin, 1947; M.S., 1948; Ph.D., 1951

JAMES A. THOMPSON, Research Associate (8) 1955
B.A., St. Olaf College, 1955

LOUIS MILTON THOMPSON, Professor of Soils; Professor in Charge of Farm Operation (1)
B.S., Texas A&M., 1935; M.S., Iowa State, 1947; Ph.D., Columbia, 1941

WALTER I. THOMAS, Assistant Professor of Farm Crops (1, 2) 1956, 1949
B.S., Iowa State, 1949; M.S., 1953; Ph.D., 1955

HARVEY E. THOMPSON, Associate Professor of Farm Crops (2, 3) 1954, 1950
B.S., Wisconsin, 1947; M.S., 1948; Ph.D., 1951

JAMES A. THOMPSON, Research Associate (8) 1955
B.A., St. Olaf College, 1955

WILLIAM H. THOMPSON, Professor of Industrial Administration (1, 6) 1951, 1942
B.S., Pennsylvania State Teachers, 1934; M.S., Syracuse, 1939; Ph.D., Iowa State, 1948

GEORGE W. THOMSON, Associate Professor of Forestry (1) 1956, 1946
B.S., Iowa State, 1943; M.S., 1947; Ph.D., 1956

LOIS H. TIFFANY, Assistant Professor of Botany (1) 1956, 1950
B.S., Iowa State, 1945; M.S., 1947; Ph.D., 1956

GERARD TINTNER, Professor of Economics, Mathematics and Statistics (1, 2) 1946, 1937
Ph.D., Vienna, 1929

PAUL L. TYSSESS, Instructor in Industrial Engineering (1) 1957
B.S., Iowa State, 1949

BETTY L. TAYLOR, Assistant Professor of Physical Education for Women (1) 1951, 1948
B.S., Wisconsin, 1947

RICHARD F. TOUSSAINT, Research Associate (8) 1956
B.S., St. Thomas, 1956

GEORGE R. TOWN, Professor of Electrical Engineering; Associate Director of the Engineering Experiment Station (1, 4) 1949
E.E., Rensselaer Polytechnic Institute, 1926; D.Engr., 1929

RALPH L. TOWN, Instructor in Speech (1) 1955
B.A., Lehigh, 1953; M.A., Northwestern, 1954

CHARLES L. TOWNSEND, Instructor in Electrical Engineering (1) 1955
B.S., Oklahoma, 1953

ALLAN L. TRAPP, Research Associate; Veterinary Pathology (10) 1957
B.S., Michigan, 1954; D.V.M., 1956

MARIAN LEE TRIPP, Associate; Production Assistant WOI AM-FM (7) 1956
B.S., Iowa State, 1956

CLARENCE J. TRUSKA, Assistant Professor of Electrical Engineering (1) 1956, 1953
B.S., Iowa State, 1950; M.S., 1956

BETTY LEA TROUT, Instructor in Home Economics Education (1) 1955
B.S., Idaho, 1950

WILLIAM G. TROXELL, Capt., Assistant Professor of Air Science (1) 1956
B.S., Wichita, 1952

MELVIN TSCHETTE, Research Associate (8) 1954
B.A., Augustana (South Dakota), 1954

HELEN MARIE TUCKER, Associate, Home Management (3) 1956, 1950
B.A., Iowa State Teachers, 1948

GAYLORD TWITTE, Research Associate (8) 1956
B.S., Hamline, 1936

ARTHUR P. TWINOOG, Professor of Vocational Education (1, 5) 1944, 1937
B.A., Iowa, 1924; M.S., Iowa State, 1931

WOODROW TYSON, Sfc., Instructor in Military Science (1) 1956

ROBERT E. UHRIC, Associate Professor of Theoretical and Applied Mechanics (1, 8) 1956
B.S., Illinois, 1948; M.S., Iowa State, 1950; Ph.D., 1954

MARTIN JOHN ULMER, Associate Professor of Zoology (1) 1953, 1950
B.S., Michigan, 1942; M.S., 1943; Ph.D., 1950

WILLIAM ROBERT UNDERHILL, Professor of Speech (1) 1955, 1947
A.B., Manchester, 1946; M.A., Northwestern, 1947; Ph.D., 1955

FREDERICK H. URBIN, Sfc., Instructor in Military Science (1) 1956
HERBERT ORDELL USTRUD, Associate Professor of Civil Engineering (1) 1956, 1939
B.S., South Dakota State, 1937; M.S., Iowa State, 1939

BENJAMIN F. VANCE, Assistant Professor of Horticulture (3) 1952
B.S., Missouri, 1948

THOMAS FRANKLIN VANCE, Professor of Child Development and Psychology (1) 1927, 1914
A.B., Coe, 1909; M.A., Iowa, 1911; Ph.D., 1913

DAVID A. VAN HORN, Instructor in Civil Engineering (1) 1955, 1954
B.S., Iowa State, 1951; M.S., 1956

HELEN JOHNSON VANZANTE, Assistant Professor of Household Equipment (1) 1955, 1942
B.S., South Dakota State, 1928; M.S., Iowa State, 1942; Ph.D., 1946

RAYMOND A. VELENE, Assistant Professor of Electrical Engineering; Classification Officer Engineering Administration (1) 1955, 1943
B.S., Iowa State, 1936; B.S.E.E., 1946

RUSSELL M. VIRQUAIN, Professor, Personnel Officer in Agriculture, and Director of Short Courses, 1947 1920
A.B., Nebraska Wesleyan, 1915; M.Sc., Missouri, 1917; A.B., Nebraska Wesleyan, 1927

BERNARD VINOGRADE, Professor of Mathematics (1, 6) 1945
B.S., City College of New York, 1937; M.A., Michigan, 1940; Ph.D., 1942

RICHARD F. VOGL, Associate, Program Director WOI-AM-FM (7) 1951, 1945
B.S., Iowa State, 1949

ADOLPH F. VOIGT, Professor of Chemistry; Assistant to the Director of the Institute for Atomic Research (1, 8) 1955, 1942
B.A., Pomona, 1935; M.A., Claremont, 1936; Ph.D., Michigan, 1942

CARL LEROY VOLE, Research Associate (8) 1954
B.A., Concordia, 1954

EMIL CONRAD VOLZ, Professor of Horticulture (1) 1928, 1914
B.S., Michigan State, 1914; M.S., Cornell, 1918

CARL M. VONKROSIGK, Associate (2) 1956, 1954
B.S., Oregon State, 1951; M.S., Iowa State, 1956

GENE WAKEFIELD, Research Associate (8) 1955
B.S., Colorado A&M, 1955

RAY E. WAKELEY, Professor of Sociology (1, 2, 6) 1944, 1930
B.S., Pennsylvania State, 1917; M.S., Wisconsin, 1924; Ph.D., Cornell, 1928

ALBERT LYELL WALLACE, Professor of English (1) 1942, 1935
B.A., Park, 1929; M.A., Iowa, 1930; Ph.D., 1936

HOMER W. WALLACE, Assistant Professor of Dairy Industry (1, 2, 3) 1955
B.S., Pennsylvania State, 1951; M.S., Wisconsin, 1953; Ph.D., 1955

JOHN C. WALLACE, Research Associate (8) 1956
B.S., Iowa State, 1950

JOSEPH KENNETH WALLACE, Professor of Industrial Engineering and Head of the Department (1) 1942
A.B., Ohio, 1932; B.M.E., 1932; I.E., 1941

JAMES J. WALLACE, Professor of Economics (1, 2) 1951, 1925
B.S., Iowa State, 1916

DONALD W. WALLACE, Associate (2, 3) 1956
B.S., Iowa State, 1950

ABDUS WALTER, Associate; Assistant Extension Editor Home Economics Television (3) 1956, 1952
B.S., Iowa State, 1951

PAUL R. WALTER, Associate, Poultry Husbandry (3) 1955
B.S., Iowa State, 1955
E. FRANCES WARNER, Assistant Professor of Library Science; Exchange Librarian (1) 1956, 1923
  B.A., Ohio Wesleyan, 1912; M.A., 1913; B.S.L.S., Illinois, 1919

MARGARET C. WARNING, Professor of Textiles and Clothing and Head of the Department (1, 2) 1955
  B.A., Morningside, 1936; B.S., Washington, 1944; M.A., 1945; Ph.D., Michigan State, 1956

CAROLYN WARREN, Instructor in English and Speech (1) 1956
  B.A., David Lipscomb, 1953; M.A., Northwestern, 1956

ERIC WARREN, Associate, Music Director WOI-AM-FM (7) 1954

GLENN H. WASSOM, Associate, Farm Crops (2) 1956, 1955
  B.S., Iowa State, 1953

CLAIR BENJAMIN WATSON, Professor of Architecture (1) 1956, 1946

ALICE HELEN WAUGH, Associate Professor of Applied Art (1) 1948, 1927
  B.S., Missouri, 1916

JOHN WEBBER, Capt., Assistant Professor of Architecture (1, 4, 8) 1951, 1938
  B.S., Iowa State, 1925; M.S., 1927

EDWARD B. WEISS, Associate, Studio Supervisor WOI-TV (7) 1953
  B.S., Columbia (Chicago), 1948; M.S., 1949

HARRY J. WEISS, Associate Professor of Mathematics (1, 4, 6) 1956, 1954
  B.S., Carnegie Institute of Technology, 1947; M.S., 1949; D.Sc., 1951

MILDRED KINGSLEY WELLMAN, Assistant Professor of Home Economics; District Home Economics Supervisor (3) 1948
  B.S., Wisconsin, 1922; M.S., Illinois, 1947

ROBERT GILLITT WHEAT, Associate, Farm Crops (2) 1953, 1951
  B.S., Iowa State, 1949; M.S., 1955

ESTHER WHEELock, Instructor in English and Speech (1) 1954
  B.S., West Virginia, 1949; M.A., 1952

ESTHER WHEATSTONE, Associate Professor of Home Economics; State Girls' 4-H Club Leader (3) 1947, 1943
  B.S., Iowa State, 1932; M.S., 1945

WILLIAM RUSSELL WHITFIELD, Associate Professor of Poultry Husbandry (3) 1947, 1927
  B.Sc., Nebraska, 1927

JOHN G. WHITTAKER, Capt., Assistant Professor of Military Science (1) 1956
  B.S., Ohio, 1949

DONALD B. WHITE, Associate, Horticulture (2) 1956
  B.S., Massachusetts, 1956

ROBERT F. WHITE, Associate, Statistics (2) 1956, 1953
  B.S., Rutgers, 1950; M.S., Connecticut, 1953; M.S., Iowa State, 1956

THOMAS WILLIAM WICKERSHAM, Assistant Professor of Animal Husbandry (3) 1955, 1946
  B.S., Iowa State, 1941; M.S., 1954

JAMES ROY WICK, Assistant Professor of Zoology and Entomology (1) 1954, 1951
  B.S., Iowa Wesleyan, 1948; M.S., Kansas State, 1950; Ph.D., Iowa State, 1954

RUTH M. WHITTOCK, County Extension Home Economist (3) 1957
  B.S., Iowa State, 1954
MERLE OLIVER WIEVER, Assistant Professor of Vocational Education (1) 1953, 1948
B.S., Iowa State Teachers, 1938; M.S., Iowa State, 1950

SAMUEL C. WIGGINS, Assistant Professor of Botany and Farm Crops (1, 2) 1951
B.S., Nebraska, 1947; M.S., Wisconsin, 1948; Ph.D., 1951

DAVID R. WILDER, Assistant Professor of Ceramic Engineering (1, 8) 1956, 1952
B.S., Iowa State, 1951; M.S., 1952

HARLEY A. WILLIAMS, Professor of Chemistry and Associate Director of the Institute for Atomic Research (1, 8) 1947, 1927
A.B., Drake, 1923; Ph.D., Iowa State, 1931

RICHARD W. WILKIE, Instructor in English and Speech (1) 1957
B.S., Kansas State Teachers, 1950; M.S., 1951

ELEANOR S. WILLIAMS, Assistant Professor, Assistant Extension Editor (3) 1943, 1936
B.A., Oregon State, 1919

GEORGE WILKINSON, Associate, Recreation (3) 1954
B.S., George Williams, 1952

JOHN ANDERSON WILKINSON, Professor of Chemistry (1, 6) 1919, 1913
B.Sc., Ohio, 1903; Ph.D., Cornell, 1909

DALE ROWLAND WILSON, Associate Professor, Assistant Extension Editor, WOI-TV (3, 7) 1951, 1943
B.S., Iowa State, 1939

DANIEL E. WILLIAMS, Research Associate (8) 1953
B.S., Missouri Valley College, 1953

BENJAMIN S. WILLIS, Assistant Professor of Electrical Engineering (1) 1927, 1924
B.S., Minnesota, 1917; E.E., Iowa State, 1926; M.S., 1929

ELISABETH CURTIS WILLIS, Associate (2) 1956, 1944
B.A., Wellesley, 1928; M.A., Columbia, 1930; Ph.D., Chicago, 1942

TED L. WILSON, Assistant Professor of Agricultural Engineering (3) 1955, 1952
B.S., Iowa State, 1949; M.S., Oklahoma A&M., 1952

LAWRENCE HERRICK WILSON, Assistant Professor of Physics (1) 1920, 1919
A.B., Valparaiso, 1913; B.S., Chicago, 1914

ROBERT L. WILMERS, GMI, Instructor in Naval Science (1) 1956

CARROLL PATON WILSON, Professor of Farm Crops (1, 2) 1947, 1937
B.S., Wisconsin, 1926; Ph.D., Michigan State, 1931

EVELYN GEORGIANA WILMERSBERGER, Assistant Professor of Library Science and Head, Catalog Department (1) 1946, 1924
A.B., Bates, 1927; B.S., Simmons, 1924; M.S., Columbia, 1939

SAMUEL VON WINBUSH, Research Associate (8) 1956, 1953
B.S., Tennessee, 1953; M.S., Iowa State, 1956

ELIZABETH ARNOLD WINDSOR, Assistant Professor of Library Science and Head, Reference Department (1) 1954
A.B., Illinois, 1931; B.S.L.S., 1932; M.S.L.S., 1938

CARL M. WISE, Assistant Professor of Architecture and Architectural Engineering (1) 1956, 1927
B.S., Minnesota, 1924

KEITTE WOLF, Research Associate (8) 1957
B.S., Kansas State Teachers, 1957

LEONARD WOLF, Professor of Architecture and Architectural Engineering and Head of the
Department (1) 1953, 1937
B.S., Iowa State, 1930; M.S., 1932

ROGER C. WOLFE, S/Sgt., Instructor in Air Science (1) 1956

WILLIAM B. WOLFE, Instructor in Industrial Engineering (1)
B.S., Iowa State, 1952; M.S., 1957

DONALD G. WOOLLEY, Associate, Farm Crops (2) 1957, 1956
B.S., Utah State Agricultural, 1951; M.S., 1956

ROBERT E. WORTHINGTON, Associate (2) 1956
B.S.A., Berry, 1952; M.S., North Carolina State, 1955

MAX S. WORTMAN, Jr., Instructor in Engineering Drawing (1) 1956
B.S., Iowa State, 1956

EARL O. WRIGHT, Assistant Professor of Dairy Industry; Extension Specialist (3) 1954
B.S., Wisconsin State, 1941; M.S., Wisconsin, 1953

FRED MARION WRIGHT, Assistant Professor of Mathematics (1) 1954, 1953
B.A., Denison, 1944; M.S., Northwestern, 1949; Ph.D., 1953

WALLACE WRIGHT, Professor of Economics (1) 1938, 1930
A.B., Dartmouth, 1919; M.A., Stanford, 1924; Ph.D., 1930

NORRIS WILSON YATES, Assistant Professor of English (1) 1955, 1953
B.A., Oregon, 1946; M.A., Wisconsin, 1947; Ph.D., New York, 1953
HARRY W. YODER, Assistant Professor of Veterinary Hygiene (10) 1957  

LESTER YODER, Associate Professor of Chemistry (1, 2) 1956, 1917  
B.S.A., Purdue, 1916; M.S., 1917

JAMES G. Yoho, Associate Professor of Forestry (1, 2) 1956, 1953  
B.S., Georgia, 1947; M.F., New York State, 1948; Ph.D., Michigan State, 1956

DONALD F. YOUNG, Assistant Professor of Theoretical and Applied Mechanics (1) 1956, 1951  
B.S., Iowa State, 1951; M.S., 1952; Ph.D., 1956

DANIEL J. ZAFFARANO, Associate Professor of Physics (1, 8) 1949  
B.S., Case Institute of Technology, 1939; M.S., Indiana, 1948; Ph.D., 1949

MARY A. ZERVINS, Research Associate (8) 1954  
B.S., Iowa State, 1954

WILLIAM JOHN ZIMMERMANN, Assistant Professor (10) 1955, 1951  
B.S., Mankato State Teachers, 1947; M.S., Iowa State, 1952; Ph.D., 1955

WILLIAM GEORGE ZMOLEK, Assistant Professor of Animal Husbandry (3) 1948, 1943  
B.S., Iowa State, 1944; M.S., 1951

JOHN T. ZUMBRU, Instructor in Economics (1) 1956  
B.S., Middle Tennessee State, 1942; M.A., Tennessee, 1949

EXTENSION IN AGRICULTURE AND HOME ECONOMICS

JAMES H. HILTON, B.S., M.S., D.Sc., President
FLOYD ANDRE, B.S., M.S., Ph.D., Director
MARVIN A. ANDERSON, B.S., M.S., Ph.D., Associate Director
MAURICE SOULTS, B.S., Assistant Director
LOUISE MARIE ROSENFELD, B.S., Assistant Director
for Home Economics

AGRICULTURE AND HOME ECONOMICS

EXTENSION FIELD STAFF

CED—County Extension Director.
CEHE—County Extension Home Economist.
CEYA—County Extension Youth Assistant.
Asst. CED—Assistant County Extension Director.
CEHE (Cons. Inf.)—County Extension Home Economist (Consumer Information).
Area Agron.—Area Agronomist.
Area Soil Con.—Area Soil Conservationist.
Dist. Y. A.—District Youth Assistant.

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<td>D. Ivan Johannes, CED</td>
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<td>Emogene Y. Brown, CEHE</td>
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<td>George S. Buck, Asst. CED</td>
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<td>F. C. O’Riley, CED</td>
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Administrative Board

President James H. Hilton, chairman; J. H. Jensen, Andre, Bear, Hixon, Kratochvil, LeBaron, Merchant, J. F. D. Smith, Spedding, Marvin Anderson, Quincy C. Ayres, George M. Browning, Elder, Grant, Orr, Platt, Schaefer, Schilletter, Town; Gowan, secretary.

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Traffic—Schaefer, chairman; Csanyi, Lauer, Rothacker, Spangler; one student member.
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Academic Curricula and Programs

Special announcements of the different branches of the work are supplied free of charge on application. Address THE REGISTRAR, Iowa State College, Ames, Iowa.

Division of Agriculture

CURRICULA LEADING TO THE DEGREE OF BACHELOR OF SCIENCE

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Agricultural Education
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Agricultural Journalism
Agronomy
Animal Husbandry
Dairy Husbandry
Dairy and Food Industries
Dairy Industry with option in Chemistry (Five-year)
Dairy Industry with option in Economics
Farm Operation
Food Industries
Forestry
Forestry (Five-year), Majors in Conservation
Farm Forestry
Forest Utilization
Range Management
Wildlife Management
Horticulture, options in Floriculture
Fruit Crops
Nursery Management
Vegetable Crops
Turf Management
Industrial Education
Landscape Architecture
Poultry Husbandry
Rural Sociology

NON-DEGREE AGRICULTURAL PROGRAMS

Dairy Plant Operation (Four quarters)
Farm Operation (Six quarters)

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CURRICULA LEADING TO THE DEGREE OF BACHELOR OF SCIENCE

Aeronautical Engineering
Agricultural Engineering
Ceramic Engineering
Chemical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering
Mechanical Engineering

OTHER CURRICULUMS

FIVE YEAR

Architectural Engineering
Architecture

Division of Home Economics

CURRICULA LEADING TO THE DEGREE OF BACHELOR OF SCIENCE

Applied Art
Child Development
Food and Nutrition, Majors in Dietetics
Experimental Foods
Community Nutrition
Home Economics for General Education
Home Economics Journalism
Home Economics and Related Science
Home Economics Education
Home Management
Household Equipment
Institution Management, Majors in College Food and Housing Administration
Restaurant Management
Textiles and Clothing

Division of Science

CURRICULA LEADING TO THE DEGREE OF BACHELOR OF SCIENCE

Agricultural Business
Chemical Technology
Physical Education for Men
Rural Sociology
Science with Majors in Bacteriology
Botany
Chemistry
Climatology and Meteorology
Economics or Sociology
Food Technology
Foreign Trade and Service Programs
General Science
Genetics
Geology
History, Government or Philosophy
Industrial Administration
Industrial Psychology
Mathematics
Naval Science
Physical Education for Men
Physics
Statistics
Technical Journalism
Zoology and Entomology

PREPARATION FOR HUMAN MEDICINE
(Three or four years)

PREPARATION FOR VETERINARY MEDICINE
(Two years)

Division of Veterinary Medicine

CURRICULA LEADING TO THE DEGREE OF DOCTOR OF VETERINARY MEDICINE

Veterinary Medicine
The College

The Iowa State College of Agriculture and Mechanic Arts conducts work in five major fields:

Agriculture
Engineering
Home Economics
Science
Veterinary Medicine

The Graduate College conducts research and instruction in all these fields.

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