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*The College of Agriculture, Forestry,
and Home Economics*

Part I

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1932-1934



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THE COLLEGE OF AGRICULTURE, FORESTRY,
AND HOME ECONOMICS

FACULTY

ADMINISTRATION

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Walter C. Coffey, M.S., LL.D., Dean of the Department of Agriculture
Edward M. Freeman, Ph.D., Dean of the College of Agriculture, Forestry,
and Home Economics
Edward E. Nicholson, M.A., Dean of Student Affairs
Anne D. Blitz, M.A., Dean of Women
Rodney M. West, B.A., Registrar

AGRICULTURAL BIOCHEMISTRY

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Palmer, Ph.D.; Associate Professor Cornelia Kennedy, Ph.D.; Assist-
ant Professor W. Martin Sandstrom, Ph.D.; Instructors Henry B.
Bull, Ph.D., Edward R. Linner, B.S., Charles F. Rogers, M.S.

AGRICULTURAL ECONOMICS

Professors Oscar B. Jesness, Ph.D., Andrew Boss, D.Sc., Warren C. Waite,
Ph.D.; Associate Professors Edwin C. Johnson, Ph.D., George A. Pond,
Ph.D.; Assistant Professors Rex W. Cox, Ph.D., Lewis F. Garey,
Ph.D.; Instructors Don S. Anderson, B.S., Percy M. Lowe, M.A., Lloyd
L. Ulyot, B.S.; Extension Specialists William L. Cavert, Ph.D., Spen-
cer B. Cleland, B.S., Daniel C. Dvoracek, B.S., W. Bruce Silcox, M.S.

AGRICULTURAL EDUCATION

Professor Ashley V. Storm, Ph.D., Associate Professor Albert M. Field,
Ph.D.; Instructor Victor E. Nylin, M.S.

AGRICULTURAL ENGINEERING

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ant Professors Jesse H. Neal, M.S., Julius Romness, B.A., James B.
Torrance, B.S. in Agr., Arthur G. Tyler, B.S., Hall B. White, M.S.;
Instructors Chester L. Berggren, B.S., J. Grant Dent, Orlando W.
Howe, B.S. in A.E., Loren W. Neubauer, B.S. in C.E., Lawrence H.
Schoenleber, M.S. in A.E.

AGRONOMY AND PLANT GENETICS

Professor Herbert K. Hayes, D.Sc.; Associate Professor Albert C. Arny,
M.S.; Assistant Professors Iver J. Johnson, Ph.D., LeRoy Powers,
Ph.D., Harold K. Wilson, Ph.D.; Instructor Charles W. Doxtator,
M.S.; Extension Specialist Ralph F. Crim, B.S. in Agr.

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ANIMAL HUSBANDRY

Professors Walter H. Peters, M.Agr., Evan F. Ferrin, M.Agr.; Associate Professor Laurence M. Winters, M.S.; Assistant Professors Philip A. Anderson, B.S. in Agr., Alfred L. Harvey, M.S.; Instructor Donald W. Johnson, M.S.; Extension Specialists William E. Morris, M.S., Henry G. Zavoral, B.S.A.

DAIRY HUSBANDRY

Professors Clarence H. Eckles, D.Sc., Willes B. Combs, M.A.; Professor Emeritus Theophilus L. Haecker; Associate Professors Harold Macy, Ph.D., William E. Petersen, Ph.D.; Assistant Professor Thor W. Gullickson, M.S.; Instructors Nat N. Allen, B.S., Samuel T. Coulter, M.S.; Assistant Frank B. Baldwin, B.S.; Extension Specialists Charles C. Geddes, Edwin A. Hanson, B.S. in Agr., Ramer Leighton, Harold R. Searles, B.S. in Agr.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

Professors William A. Riley, Ph.D., Arthur G. Ruggles, M.A., Maurice C. Tanquary, Ph.D.; Associate Professors Alexander A. Granovsky, Ph.D., Clarence E. Mickel, Ph.D.; Assistant Professors Ralph W. Dawson, Ph.D., Harold H. Shepard, Ph.D.; Instructors Ralph T. King, M.S., Leslie W. Orr, M.S.

FORESTRY

Professors Henry Schmitz, Ph.D., John H. Allison, Ph.B., M.F., Edward G. Cheyney, B.A., Raphael Zon, B.A., B.S., F.E.; Assistant Professors Randolph M. Brown, M.F., M.S., Thorwald S. Hansen, B.S., M.F., Louis W. Rees, Ph.D.

HOME ECONOMICS

Professor Wylle B. McNeal, M.A.; Associate Professors Alice Biester, M.A., Alice M. Child, M.A., Harriet I. Goldstein, Jane M. Leichsenring, Ph.D., Marion Weller, B.A., Assistant Professors Frances Dunning, M.S., Edna E. Fowler, M.A., Mildred King, M.A., Ethel L. Phelps, M.S., Lucy A. Studley, M.A.; Instructors Eleanor F. Anderson, B.S., Carlotta M. Brown, Ruth M. Davis, B.S., Anna Gertrude Dinsmore, M.A., Margaret Ennis, M.S., Vetta Goldstein, Ethel R. Gorham, M.A., Ada Guttman, Hope H. Hunt, M.S., Mildred Larson, B.S., Kathryn B. Niles, M.S., Gladys Nordeen, B.S., Ruth F. Sego'son, B.S., Mary A. Steers, M.S., Bernice Strawn, M.S., Mertie Willigar, M.S.

HOME ECONOMICS EDUCATION

Professor Wylle B. McNeal, M.A.; Associate Professors Clara M. Brown, M.A., Harriet I. Goldstein; Assistant Professor Ella J. Rose, M.A.

HORTICULTURE

Professor William H. Alderman, B.S., Associate Professor Wilfred G. Brierley, Ph.D.; Assistant Professors Troy M. Currence, Ph.D., Fred A. Krantz, Ph.D., Lewis E. Longley, M.S., Arthur N. Wilcox, Ph.D.; Instructors Ernest Angelo, M.S., Arthur E. Hutchins, B.S.; Assistant Louis Sando.

MILITARY SCIENCE AND TACTICS

Professor John H. Hester, Major, Infantry; Assistant Professors William G. Guthrie, Major, Medical Corps, Theron G. Methven, Major, Infantry, Willis Shippam, Major, Coast Artillery, William C. Webb, Jr., Major, Dental Corps, Hammond D. Birks, Captain, Infantry, Murray T. Davenport, Captain, Infantry, William A. Ellis, Captain, Infantry, Emil Krause, Captain, Infantry, Rex W. Minckler, Captain, Signal Corps, Porter P. Wiggins, Captain, Infantry, Vincent J. Conrad, 1st Lieutenant, Infantry, Richard A. Ericson, 1st Lieutenant, Coast Artillery, Harlan N. Hartness, 1st Lieutenant, Infantry, Hewitt W. Richmond, 1st Lieutenant, Coast Artillery; Instructors Alfred Brandt, Master Sergeant, Infantry, Harry E. Strider, Master Sergeant, Signal Corps, Aubrey R. Dunkum, Technical Sergeant, Coast Artillery, Roy Cunningham, Staff Sergeant, Infantry, Ernest R. Mylk, Sergeant, Coast Artillery, Arley V. Buckner, Sergeant, Infantry, Clayton A. Peterson, Sergeant, Infantry.

PHYSICAL EDUCATION FOR MEN

Associate Professors Louis J. Cooke, M.D., Louis F. Keller, M.A.

PHYSICAL EDUCATION FOR WOMEN

Professor J. Anna Norris, M.D.; Assistant Professors May S. Kissock, M.A., Alice J. H. Tolg, M.D.; Instructors Josephine Dickson, B.A., Helen M. Starr, B.S.

PLANT PATHOLOGY

Professors Edward M. Freeman, Ph.D., Rodney B. Harvey, Ph.D., Elvin C. Stakman, Ph.D.; Associate Professors Jonas J. Christensen, Ph.D., Julian G. Leach, Ph.D.; Assistant Professor Alvin H. Larson, B.S.; Instructors Clyde C. Allison, M.S., Clyde Christensen, M.S., Louise Dodsall, Ph.D., Carl J. Eide, M.S., Raymond H. Landon, M.S.

POULTRY HUSBANDRY

Professors Arthur C. Smith, B.S., Frederick B. Hutt, Ph.D.; Extension Specialist Cora E. Cooke, B.S.

PUBLICATIONS AND RURAL JOURNALISM

Professor William P. Kirkwood, M.A.

RHETORIC

Assistant Professors Robert C. Lansing, M.A., William J. Routledge, B.A.; Instructors Helen Thompson, M.A., Marjorie H. Thurston, M.A.

SOILS

Professor Frederick J. Alway, Ph.D.; Associate Professor Clayton O. Rost, Ph.D.; Assistant Professor Paul R. McMiller, M.S.

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VETERINARY MEDICINE

Professors Clifford P. Fitch, M.S., D.V.M., D.Sc., Willard L. Boyd, D.V.S.; Associate Professors Charles R. Donham, D.V.M., M.S., Howard C. H. Kernkamp, D.V.M., M.S.; Instructor Walter L. Nilson, D.V.M.

MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION IN
THE COLLEGE OF AGRICULTURE, FORESTRY,
AND HOME ECONOMICS

ARCHITECTURE

Assistant Professor Elmer E. Young; Instructor Ivan Doseff, B.S.

ART EDUCATION

Professor Ruth Raymond, M.A.; Assistant Professor Robert S. Hilpert, M.A.; Instructors Elmer E. Harmes, Josephine Lutz, B.A.

BACTERIOLOGY AND IMMUNOLOGY

Instructor Charles E. Skinner, Ph.D.

BOTANY

Professors William S. Cooper, Ph.D., C. Otto Rosendahl, Ph.D., Josephine Tilden, M.S.; Associate Professors George O. Burr, Ph.D., Frederic K. Butters, Ph.D.; Assistant Professor Ned L. Huff, M.A.

CHILD WELFARE INSTITUTE

Professors John E. Anderson, Ph.D., Florence L. Goodenough, Ph.D.; Associate Professors Josephine C. Foster, Ph.D., Esther McGinnis, Ph.D.; Assistant Professor Edith Boyd, M.D.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

Associate Professor Wesley E. Peik, Ph.D.

EDUCATIONAL PSYCHOLOGY

Professor Wilford S. Miller, Ph.D.; Assistant Professor Marvin J. Van Wagenen, Ph.D.

GEOLOGY AND MINERALOGY

Professor William H. Emmons, Ph.D.; Associate Professors John W. Gruner, Ph.D., George A. Thiel, Ph.D.; Instructor Carl E. Dutton, M.A.

HISTORY AND PHILOSOPHY OF EDUCATION

Associate Professor Ross L. Finney, Ph.D., LL.B.; Instructor Jean H. Alexander, M.A.

INORGANIC CHEMISTRY

Professor Lloyd H. Reyerson, Ph.D.; Assistant Professor Norville C. Pervier, Ph.D.

PHYSIOLOGY

Professors Elias P. Lyon, Ph.D., M.D., LL.D., Jesse F. McClendon, Ph.D.; Associate Professor Esther Greisheimer, Ph.D., M.D.; Assistant Professors Allan Hemmingway, Ph.D., Joseph T. King, Ph.D., M.D.; Instructor Dean A. Collins, Ph.D.; Assistant Wallace D. Armstrong, M.S.

PREVENTIVE MEDICINE AND PUBLIC HEALTH

Professor Harold S. Diehl, M.A., M.D.; Associate Professors Ruth E. Boynton, M.S., M.D.; Assistant Professor Ralph V. Ellis, M.A., M.D.; Instructors Mattie J. Bullard, M.D., Hally J. Fisher, R.N., Meredith B. Hesdorffer, M.D., Robert G. Hinckley, M.D., Bernard A. Watson, M.D.

PSYCHOLOGY

Professor Richard M. Elliott, Ph.D.

SOCIOLOGY AND SOCIAL WORK

Professor Robert W. Murchie, Ph.D.; Instructor Barnett O. Williams, M.S.

ZOOLOGY

Assistant Professors Ralph W. Dawson, Ph.D., Samuel Eddy, Ph.D.; Instructor John P. Turner, Ph.D.

GENERAL INFORMATION

ADMISSION

New students are admitted at the opening of any quarter provided a suitable program can be arranged. Prospective students, however, are advised to enter at the opening of the fall quarter if possible.

All students entering for the first time must submit their credentials to the registrar's office, University Farm, St. Paul.

Admission is either by certificate (in the case of graduates of accredited schools) or by examination.

For details of admission requirements see the bulletin of general information.

Graduates of the School of Agriculture of the University of Minnesota who have completed the two summers of supervised work offered in the school course, one additional school year, and one additional summer's work, or the equivalent thereof, will be admitted to the College of Agriculture, Forestry, and Home Economics.

Applicants for admission are urged to present physics (1 unit) and chemistry (1 unit), for entrance. If not completed in the high school, additional work in these subjects will have to be taken in the University, thus postponing some of the technical courses.

Every prospective student in agriculture is urged to obtain, before entering college, at least six months' practical experience on a farm. Entering students whose farm experience credentials are not satisfactory will be examined as to their familiarity with farm practices, and farm experience will be required during the college course in accordance with the results of these examinations. For students who major in dairy husbandry at least three of the six months of approved farm experience must be on an accredited dairy farm or in a well-organized dairy manufacturing plant.

ADVANCED STANDING

Advanced standing credit is allowed provisionally subject to one year satisfactory work in residence. Credits in courses from any recognized institution of college grade are accepted so far as such courses are equivalent in subject-matter to required or elective work of the curriculum. Students desiring to transfer to this college after completing two years or less in a junior college or an institution in which the technical courses are not available may do so with little or no loss of credit by so arranging their work as to correspond as closely as possible with the following suggestions:

Pre-Agriculture and Pre-Forestry Courses in Junior Colleges

Students from accredited junior colleges who have completed the general requirements described below will be admitted to the junior class in the agricultural and forestry courses. The amount of additional time required to complete the work for the degree of bachelor of science will depend (1) upon the quality and quantity of work which such students can do and

(2) upon the special curriculum which they elect. Many of these curricula may be completed in two years by students who maintain at least the average quality and quantity of work. Additional work in summer sessions or regular quarters may be necessary in some of the special curricula. Since a large number of fields of specialization are open to students, and since these curricula vary so greatly in the subject-matter courses required, it is impossible to make any more specific statement. The requirements given below can be satisfied in the average junior college which offers a fundamental arts and science curriculum. Students in some junior colleges can select additional subjects which may be directly applicable and very helpful in the field of specialization to be followed later. Students who have not completely met the requirements will be given proportional credit.

1. A total of 90 quarter credits (1 semester credit = 1.5 quarter credits)

2. Required courses:

(a) Botany 9-15 cred.; Gen. Chem. 10-15 cred.; Zool. 9-15 cred.; Rhetoric and English 9-15 cred.

(b) At least two of the following: Mathematics 9-15 cred.; Economics 9-15 cred.; Modern Language 15 cred.

(c) Electives. Sufficient to bring total credits to a minimum of 90.

The following is a general list of electives applicable in one or more of the specialization fields. These subjects are, of course, not equally applicable in all fields. Sociology, psychology, economics, physics, history, advanced mathematics, technical business, agriculture, and engineering subjects, advanced English, public speaking, mechanical drawing, freehand drawing, surveying, qualitative, quantitative, and organic chemistry, advanced courses in zoology and botany, bacteriology, modern language (especially French and German). For prospective forestry students, physics and especially surveying are recommended.

Home Economics in Junior Colleges

In planning the work in the junior college with the idea of transferring to one of the home economics curricula the prospective transfer student should keep these facts in mind.

Physical and biological science courses such as general and inorganic chemistry, bacteriology, biology, and physiology are required. A student may receive exemption from physics if she has had one year of physics in high school.

Color and design, textiles, clothing, and foods courses are required in the freshman and sophomore years.

English including public speaking, psychology, and sociology are Lower Division requirements.

Credit may be allowed for such courses as listed above and for elective credits not listed.

PSYCHOLOGICAL EXAMINATION

All new students are required to take a psychological examination on entrance as a part of the matriculation procedure. Admission, however, does not depend upon the results of the examination.

EXAMINATION IN ENGLISH COMPOSITION

All freshman students are required to take the placement test in English. Those failing to pass the test will be required to do extra work in composition until their disability is removed. Students with exceptionally high scores may be exempted from part or all of the courses in freshman rhetoric.

PLACEMENT TESTS

The college desires to bring about the best correlation possible between the technical courses in the fields of agriculture, forestry, and home economics, as taught in the schools of agriculture, in the high schools, and in other institutions. Where students have taken considerable work in these technical courses, it may be desirable for them not to be required to repeat a part or all of this work in the elementary courses in the college. The amount of work taken in the preparatory school and the quality of that work, and, finally, the question as to whether or not the subject-matter course has been used for entrance to the University, must be taken into consideration. In general, two possibilities for placement tests are offered:

1. For subjects not used for entrance to the University and in which the student has had adequate training, examinations may be taken for full credit in the elementary technical course in the college. These examinations may be taken during the first six weeks of residence without fee. After that time, a five-dollar fee is required.

2. For subjects which the student has used for entrance to the University, the student may, by satisfactory examination or by the presentation of other satisfactory evidence, be given permission to omit the elementary subject in the college course, substituting therefor credits in other subjects and taking immediately the more advanced courses in this field.

FEEES

Tuition fee, per quarter	
Residents of Minnesota	\$20.00
Non-residents	30.00
Credit hour tuition fee (for students registered for less than full work)	
Residents of Minnesota	1.50
Non-residents	2.25
Students in Agricultural Business Administration will pay the fees of the School of Business Administration in their junior and senior years.	
Incidental fee, per quarter.....	6.00
Matriculation deposit ¹ (first quarter only)	
Men	15.00
Women	5.00
Special fees	
Cloquet tuition (juniors in forestry)	
Residents of Minnesota.....	20.00
Non-residents	30.00
Itasca Park tuition (freshmen in forestry) prorated on basis of regular quarter tuition per quarter of 12 weeks.....	20.00
Physical Training for Men, per quarter course.....	1.50

¹ Such charges as may be incurred for lockers, library penalties, laboratory breakage, etc., will be deducted from the amount of this deposit and the balance will be refunded by mail upon graduation or after the beginning of the first quarter the student fails to return to the University.

Special fees—*continued*

Physical Training for Women	
First year courses, per quarter.....	2.50
Other courses per quarter.....	2.00
Maximum fee, per quarter, \$3.50	
Vocal or instrumental music see general information bulletin for special fees	
Practice teaching laboratory, per credit hour.....	1.00
Examination for removal of condition.....	1.00
Examination for credit (after the first six weeks in residence).....	5.00
Special examination	5.00
Graduation fee	10.00
Change of registration, on third day of the quarter.....	3.00
and increases thereafter at \$1 per day to a maximum of.....	10.00

Late registration.—Old students must indicate their registration and pay their fees not later than two weeks before the day set for classes to begin. New students must complete their registration (including payment of fees) before the day set for classes to begin. The penalty for delay in either indicating or completing registration is two dollars. An additional dollar is charged for each day of delay after the last day set for the completion of registration and a similar charge is made for each day of delay after the last day set for payment of fees.

Important.—The regulations require that no student be allowed to register after the quarter opens except by special committee action.

FACULTY REGULATIONS

Students are held responsible for compliance with all faculty regulations. These regulations are published in a booklet issued to students at the time of registration.

REQUIREMENTS FOR GRADUATION AND DEGREES

After the completion of the prescribed curriculum including all of the required work and the required amount of elective work to make the total given below, candidates will be recommended for graduation with the degree indicated.

The number of free elective credits required for graduation will be decreased by one for each five honor points in excess of one honor point per credit. This provision does not apply to candidates in the professional curriculum in Agricultural Engineering.

Course of Study	Credit Require- ment	Honor Point Require- ment	Degree Conferred
Technical Agricultural courses.....	204	204	Bachelor of science
Agricultural Science courses	192	192	Bachelor of science
Forestry courses	204	204	Bachelor of science
Home Economics courses.....	193	193	Bachelor of science
Agricultural Engineering (professional course)	210	None	Bachelor of agricul- tural engineering
Agricultural Business Administration.....	192	192	Bachelor of business administration in agriculture
Agricultural Journalism	192	192	Bachelor of science

Scholarship requirements.—The following regulations shall become operative for all students, including transfer students, who enter the college for the first time in the fall quarter 1931-32. In so far as they apply to requirements of the junior-senior years, they shall become operative beginning with the fall quarter 1932-33 for all students entering and not previously enrolled in the junior-senior years of the college.

1. Students must present for graduation at least one honor point for each credit; i.e., the cumulative honor point average must be 1.0 or more.

2. Students with an honor point average of less than 0.2 after the completion of courses totaling 45 credits and students with an honor point average of less than 0.5 after the completion of courses totaling 90 credits shall not be readmitted to the college until after the lapse of one year, except by special permission of the Students' Work Committee.

3. Students who have completed 90 credits with an honor point average of less than 1.0 but more than 0.5 shall be permitted to take additional courses to attain the required honor point ratio of 1.0. They shall, however, be required to complete, after they have raised their honor point ratio to 1.0, not less than 90 credits of course work such as is normally programmed in the junior and senior years of their respective curricula. In no case will this lessen the total number of credits required for graduation in the curriculum concerned.

4. Students with an honor point average of 1.0 after the completion of courses totaling 90 credits shall be admitted to candidacy for the Bachelor's degree from this college.

Degree with distinction.—The degree of bachelor of science with distinction is granted to graduates of this college who have attained excellence in scholarship as evidenced by an average grade of two honor points per credit for the entire four-year curriculum. Transfer students with less than two years of work in this college shall not be eligible. Recommendations to the faculty for the degree with distinction shall be made through the Students' Work Committee on the basis of scholarship and other evidence of satisfactory achievement and advancement in the courses pursued.

Degree with high distinction.—The degree of bachelor of science with high distinction is granted to graduates of this college who have attained special excellence in scholarship as evidenced by an average of two and one-half honor points per credit for the entire curriculum. The same conditions for residence and recommendation apply as for the degree with distinction.

GRADING SYSTEM AND HONOR POINTS

There are four passing grades, A, B, C, and D, of which A is the highest and D the lowest. In addition there are the following non-passing grades: E (condition), F (failure), and I (incomplete). For rules governing the non-passing grades, see the booklet of Faculty Regulations.

Honor points are awarded on the following basis: each credit hour with a grade of A counts three honor points; each credit hour with a grade of B counts two honor points; and each credit hour with a grade of C counts one honor point. A grade of D counts no honor points.

TEACHER'S CERTIFICATES

Students expecting to receive certificates to teach upon graduation shall be registrants in the College of Education from the beginning of the junior year. Students in the College of Agriculture, Forestry, and Home Economics desiring a teacher's certificate shall in addition to their registration in this college register also in the College of Education. No formal application is necessary for transfer if such transfer is made at the beginning of the junior year. However, no student may transfer who has not earned 90 credits and at least one honor point per credit.

BOARD AND ROOM

Sanford Hall.—The one dormitory for university women is located near the Minneapolis campus. It accommodates ninety women, about one half of whom may be freshmen. Applications should be sent to the director of Sanford Hall, University of Minnesota.

Private houses.—For information concerning approved boarding and rooming houses, address the Housing Bureau, University of Minnesota, Minneapolis.

STUDENTS' BOOKSTORE

The University owns and operates a bookstore for the convenience of students and faculty. Books and supplies are handled on a profit sharing basis, rebate checks being given on all purchases with the exception of candy, special bulletins, class material, and books obtained on individual orders.

CURRICULA

AGRICULTURE

(See pages 17 to 34.)

A. Technical Agricultural Curriculum. This curriculum provides an opportunity in the junior and senior years to major in one of the following groups:

- | | |
|----------------------------------------|---------------------------------------------|
| 1. Agricultural Economics | 4. Agricultural Sciences and Plant Industry |
| 2. Agricultural Education ¹ | |
| 3. Animal Industry | 5. Agricultural Engineering |

Several suggested curricula have been arranged which students are advised to follow. These curricula are:

- | | |
|----------------------------------------|-------------------------|
| 1. General Agriculture | 6. Dairy Husbandry |
| 2. Agricultural Education ¹ | 7. Dairy Products |
| 3. Agricultural Economics | 8. Fur Farming |
| 4. Agricultural Engineering | 9. Horticulture |
| 5. Animal Husbandry | 10. Landscape Gardening |

Students desiring to specialize in one of the agricultural sciences with a view to further study in the Graduate School may arrange majors in the following fields:

- | | |
|------------------------------|------------------------------------|
| 1. Agricultural Biochemistry | 6. Entomology and Economic Zoology |
| 2. Agricultural Economics | 7. Horticulture |
| 3. Agronomy | 8. Plant Pathology and Botany |
| 4. Animal Husbandry | 9. Soils |
| 5. Dairy Husbandry | 10. Veterinary Medicine |

B. Agricultural Science Curriculum. This curriculum provides opportunities for specializing in the following fields of work:

- | | |
|------------------------------------|--------------------|
| 1. Agricultural Biochemistry | 5. Nutrition |
| 2. Agronomy | 6. Plant Breeding |
| 3. Entomology and Economic Zoology | 7. Plant Pathology |
| 4. Horticulture | 8. Soils |

C. Agricultural Engineering Professional Curriculum. The professional curriculum in Agricultural Engineering is offered jointly with the College of Engineering and Architecture. In addition to the outlined curriculum, electives may be selected in order to major in one of the following fields of work:

- | | |
|-------------------|----------------|
| 1. Farm Buildings | 3. Reclamation |
| 2. Farm Machinery | |

¹ Offered jointly with the College of Education.

D. Agricultural Business Administration Curriculum. Students desiring to prepare for admission to the School of Business Administration may complete the Agriculture Pre-Business Curriculum in the College of Agriculture, Forestry, and Home Economics. The work of the junior and senior years is offered jointly with the School of Business Administration.

E. Agricultural Journalism. This curriculum is offered jointly with the College of Science, Literature, and the Arts.

FORESTRY

(See pages 35 to 39.)

The curriculum in Forestry provides an opportunity in the junior and senior years to major in one of the following fields:

- | | |
|-------------------------|--------------------|
| 1. General Forestry | 4. Grazing |
| 2. Commercial Lumbering | 5. Game Management |
| 3. Forest Technology | 6. Forest Sciences |

HOME ECONOMICS

(See pages 40 to 48.)

In home economics opportunity is provided in the junior and senior years to major in one of the following outlined curricula:

- | | |
|--------------------------------------------------------------------------|---------------------------|
| 1. General Home Economics, as a type of general arts education for women | 3. Textiles and Clothing |
| | 4. Dietitians |
| 2. Foods and Nutrition | 5. Institution Management |

The following teacher's curricula are also offered jointly with the College of Education:

- | | |
|-----------------------------|--------------------------|
| 6. General Home Economics | 9. Textiles and Clothing |
| 7. Home Economics Extension | 10. Related Art |
| 8. Foods and Nutrition | |

EXPLANATION OF TERMS AND COURSE NUMBERS

The quarters in which courses are offered are indicated by the letters f (fall), w (winter), s (spring), and su (summer) following the course number. For example: 5f,w,s indicates that Course 5 is given in the fall quarter and is repeated in the winter and again in the spring quarter; 5f-6w indicates a two-quarter course extending through the fall and winter quarters; and 5f,w-6w,s indicates that Course 5-6 is given in the fall and winter quarters and repeated through the winter and spring quarters.

All undergraduate courses are numbered from 1 to 100. All courses open to undergraduates and graduates are numbered from 101 to 200.

Numbers following the descriptive name of a course indicate the number of credit hours.

Course numbers in parentheses, following the number of credit hours, indicate prerequisite courses.

Descriptions of the courses listed in the following outline of the curricula, together with those of additional courses offered as electives, will be found on pages 49 to 83. The program of classes is printed in Part II. The divisional statements are arranged alphabetically according to the names of the divisions.

One *credit hour* is equivalent to (1) one lecture or recitation period requiring two hours of preparation, (2) two periods of laboratory work requiring one hour of preparation, or (3) three periods of laboratory work with no preparation, each week for one quarter.

Honor points.—See page 12 for definition.

A *major* is a series of courses equivalent to from 24 to 36 credit hours chosen from one of the elective groups.

A *minor* is a series of courses equivalent to 18 credit hours chosen from one of the elective groups.

A *required* course is a course required of all students for graduation, irrespective of their major sequence.

A *limited elective* course is an elective which may not be chosen from the same group as the major or minor.

A *free elective* course may be chosen from any courses offered in the University for which the student has completed the prerequisites.

REGISTRATION

In planning registration note particularly (a) prerequisites, (b) classes of students (fr., soph., jr., or sr.) to which courses are offered, (c) number of credits, (d) quarter or quarters offered, and be sure that provision is made in registration for the proper sequence of continuation courses.

Registration for courses as electives in other colleges of the University must be in conformity with regulations of the college offering the course.

Elective courses in the College of Science, Literature, and the Arts are separated into Lower Division courses (numbered 1 to 49) open to freshmen and sophomores, and Upper Division courses (numbered 50 to 199) open to juniors and seniors. In addition to satisfying other prerequisites a minimum of 90 credits and 90 honor points must be earned before registering for an Upper Division elective.

CURRICULA IN AGRICULTURE

- A. Technical Agricultural Curriculum, pages 17 to 28.
- B. Agricultural Science Curriculum, pages 29 to 30.
- C. Agricultural Engineering, Professional Curriculum, pages 30 to 31.
- D. Agricultural Business Administration Curriculum, pages 32 to 33.
- E. Agricultural Journalism Curriculum, pages 33 to 34.

A. TECHNICAL AGRICULTURAL CURRICULUM

This curriculum requires 204 credit hours for graduation and is made up of (1) required courses which every student must complete and (2) elective courses distributed according to several methods described below (pages 19 to 28).

REQUIRED COURSES

These courses are required of every student before graduation. They constitute approximately half of the curriculum and are considered fundamental and necessary to any curriculum in technical agriculture. Every student must complete these courses, if possible, before the end of the sophomore year. Modifications in the requirements may be permitted upon approval by the Students' Work Committee where students have a very definite objective in their college curriculum in which substitutions for certain of the listed freshman and sophomore required courses may profitably be made. Approval of the adviser by special letter must be presented with the petitions to the Students' Work Committee.

For some students the outline of the first two years, given below, represents more than the regular amount of work of 17 credit hours per quarter. In such cases those subjects which cannot be taken in the freshman and sophomore years must take precedence the following year. Phys. Ed. 1-2-3, Gymnasium, 3 (credit is allowed only when the three quarters together with Course 4 are completed) may be taken in addition to the regular schedule if desired. Care should be taken in registration to give precedence to courses offered only one quarter.

Not more than one half of the listed credit will be allowed for the courses listed under the freshman and sophomore years, below, unless completed prior to classification as a senior year except in the case of students transferring with at least one full year of advanced standing from a college where these courses are not available.

FRESHMAN YEAR

1. *Non-credit courses* required for graduation in addition to the 204 credit hours.
 - Freshman Assembly. A course of lectures offered only in the fall quarter.
 - Mil. Sci. 1f-2w-3s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.
 - Phys. Ed. 4w. Freshman Hygiene or Prev. Med. 3f,w,s. Personal Hygiene and Elementary Sanitation, 2.

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2. *General courses.*—The following courses may be registered for any quarter that they are offered except that the proper sequence of continuation courses and the prerequisites must be observed.
- Agr. Eng. 3 credits elected from the following: 5w, Farm Building Design and Construction, 3; 13f,s, Gas Engines, 3; 28w, Land Clearing, 3; 31w,s, Principles of Drainage, 3; 37f,w, Rural Sanitation, 3. One or more of these courses are required in the junior and senior years of several of the outlined curricula. If completed in meeting this requirement some other of the above courses must be substituted in the junior or senior year.
- Agron. 1f,s,¹ General Farm Crops, 3
An. Husb. 1f,w-2w,s,^{1,4} Types and Market Classes of Livestock, 6
Bot. 1f,w,s, General Botany, 4 and 6 credits selected from the following: Bot. 2, 5, 7, 12, 13, 21, 22
Dy. Husb. 1f,s,^{1,4} Elements of Dairying, 5
Hort. 6f,¹ Fruit Growing, 3; or Hort. 32s, Vegetable Growing, 3
Inorg. Chem. 1f-2w-3s, General Inorganic Chemistry, 12. Students presenting a year of high school chemistry may omit this course and register for Inorg. Chem. 9-10. Those required to take this course because of inability to carry successfully Inorg. Chem. 9-10 will be allowed not more than 10 credits.
Inorg. Chem. 9f,w-10w,s, Advanced General Inorganic Chemistry, 10. (1 yr. h. s. chem.) Those required to take Inorg. Chem. 1-2-3 may omit this course.
Math., 5 cred., or Agr. Eng. 11w, Applied Mathematics, 5
Rhet. 1f,w,s,² Rhetoric I, 3
Rhet. 2f,w,s, Rhetoric II, 3 (Rhet. 1)
Rhet. 3f,w,s, Rhetoric III, 3 (Rhet. 2)

SOPHOMORE YEAR

1. *Non-credit courses* required for graduation in addition to the 204 credit hours.
Mil. Sci. 4f-5w-6s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.
2. *Freshman courses* which were not completed during the freshman year.
3. *General courses.*—The following courses may be registered for any quarter that they are offered, except that the proper sequence of continuation courses and the prerequisites must be observed.
Agr. Biochem. 4f,³ Introduction to Organic and Biochemistry, 5 (Inorg. Chem. 10 cred.)
Agr. Biochem. 5s,³ Plant Biochemistry, 5 (Agr. Biochem. 4, Soils 6); or Agr. Biochem. 6f, Animal Biochemistry, 5 (Agr. Biochem. 4, Soils 6)
Agr. Econ. 1f,w, Principles of Economics I, 3
Agr. Econ. 2w,s, Principles of Economics II, 5 (Agr. Econ. 1)
Agr. Eng. 3f,s,¹ Mechanical Drawing, 2
Agr. Eng. 23f,s, General Physics, 5. Those presenting a year of high school physics may omit this course and substitute 5 credits elective later in their curriculum.
Bact. 41f,w,s, General Bacteriology, 5 (chem., zool.)
Soils 6w, Soils, 5 (Agr. Biochem. 4)
Zool. 14f-15w-16s, General Zoology, 9

¹ Students presenting acceptable high school work in this course may substitute an elective.

² Special attention is called to rules on delayed credit and to regulations for students with insufficient preparation in English on page 80.

³ Students who expect to major in Agricultural Education may substitute 10 credits elective for this course with the approval of the chief of the Division of Agricultural Education.

⁴ Students who expect to major in landscape gardening may substitute for these courses 11 credits in freehand drawing and architectural design with the approval of the chief of the Division of Horticulture.

JUNIOR YEAR

- Rhet. 11f,w,s, Argumentation, 3 (Rhet. 3, Rhet. 22 advised) or Rhet. 24s, Advanced Public Speaking, 3 (Rhet. 22) or Rhet. 31f,w,s, Survey of English Literature I, 5 (Rhet. 3) or Rhet. 32f,s, Survey of English Literature II, 3 (Rhet. 3) or Rhet. 33w,s, Contemporary Literature, 3 (Rhet. 3)
 Rhet. 22f,w,s, Public Speaking, 3 (Rhet. 3)

ELECTIVE COURSES

Elective courses may be distributed according to one of the following methods: I (below) or II (page 20). Every student is required to file in the registrar's office by the end of his sophomore year a statement of the curriculum which he plans to pursue during his junior and senior years. Such statements from each student will make it possible to provide a workable program of subject courses. The student may make, and is strongly advised to make, this statement at the end of his freshman year. In this case he would have ample opportunity to change his curriculum at the end of the sophomore year. A change from one curriculum to another after the close of the sophomore year is permitted only on approval and does not exempt the student from any of the requirements of the curriculum which he finally selects. Such changes usually involve inconvenience and sometimes loss of credit to the student. All students are invited to consult with the dean of the college concerning the selection of curricula.

Method I—*Open Elective Curricula*

Recommended for those students who are preparing themselves for some special line of work and who have definitely in mind the relations of subjects offered to this work:

Under this method the student, with the approval of his adviser, may select any curriculum which complies with the following requirements:

- a. A major of from 24 to 36 credit hours.
- b. A minor of 18 credit hours.
- c. Limited electives 18 credit hours, which must be selected outside of the groups from which the major and minor have been chosen, and
- d. Free electives, sufficient to meet the number of credit hours required for graduation chosen from any of the courses offered in the University.

The major and minor must be selected from different elective groups, except that students whose major is chosen from Group 4 (see below), Agricultural Sciences and Plant Industry, may select their minor from a different field of work in the same group.

ELECTIVE GROUPS

A. Groups from which major, minor, or electives may be chosen

1. Agricultural Economics
2. Agricultural Education
3. Animal Industry, including
 - Animal Husbandry
 - Dairy Husbandry
 - Poultry Husbandry
 - Veterinary Medicine

4. Agricultural Sciences and Plant Industry, including
 - Agricultural Biochemistry
 - Agronomy and Plant Genetics
 - Entomology and Economic Zoology
 - Horticulture
 - Plant Pathology and Botany
 - Soils

5. Agricultural Engineering

B. Groups from which electives only may be chosen

1. Forestry
2. Home Economics
3. Military Science and Tactics
4. Physical Education
5. Rural Publications and Journalism
6. Courses in departments of other schools and colleges of the University

Method II—*Suggested Elective Curricula*

The following curricula have been arranged and are recommended by the several departments as useful and suggestive. Changes may be made with the approval of the Students' Work Committee. The subject course programs and the offerings of subjects in different quarters are based primarily on these curricula so that students will have an opportunity of getting courses in their proper sequence and without conflict. These specified curricula are offered in the hope that they will also be of value to the students in vocational guidance. Students who desire to select any of these curricula with modifications should study the changes involved to see whether or not the desired modifications admit of a possible program.

1. CURRICULUM IN GENERAL AGRICULTURE

Recommended for those students who desire a general curriculum in agriculture. It is designed especially for those who aim to obtain a broad general training and for those who expect to engage in general farming. It emphasizes two features, viz.: to include in its subject-matter the principal fields of study in agriculture and to select the essential courses necessary to an understanding of these fields. A sufficient number of electives is provided to permit the student to emphasize any special line in which he may become interested.

This curriculum is completely included in the curricula in agricultural education and agricultural extension. It is included, with only a few substitutions, in the curricula in animal husbandry, dairy husbandry, and in horticulture.

JUNIOR YEAR

SENIOR YEAR

Fall Quarter

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Agr. Biochem. 6f, Animal Biochemistry, 5
(Agr. Biochem. 4, Soils 6)</p> <p>Agron. 121f, Grain Crops, 3 (Agron. 1, Bot. 10 cred.)</p> <p>Agron. 131f,w, Principles of Genetics, 3
(Bot. or Zool. 9 cred.)</p> <p>An. Husb. 3f, Types and Breeds of Livestock, 3 (An. Husb. 1-2)</p> <p>Hort. 6f, Fruit Growing, 3 (May be omitted if completed as a part of the general requirements)</p> <p>Electives, 0 or 3</p> | <p>Dy. Husb. 7f, Dairy Stock Selection, 2
(Dy. Husb. 101 or parallel)</p> <p>Dy. Husb. 101f, Milk Production, 5 (Dy. Husb. 1)</p> <p>Pl. Path. 1f, Plant Pathology, 5 (Bot. 10 cred.)</p> <p>Soc. 14f,w,s, Rural Sociology, 3 (sr. class. or Sociol. 1)</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Winter Quarter

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Agron. 132w, Farm Crops Plant Breeding, 3 (Agron. 131)</p> <p>An. Husb. 4w, Types and Breeds of Livestock, 3 (An. Husb. 3)</p> <p>An. Husb. 6w, Livestock Feeding, 5 (Agr. Biochem. 6) or Dy. Husb. 103w, Dairy Stock Feeding, 3 (Dy. Husb. 101, Agr. Biochem. 6)</p> <p>Ent. 63f,w, Economic Entomology, 3
(Zool. 16)</p> <p>Electives, 3 or 5</p> | <p>Agr. Econ. 102w, Farm Organization, 3
(Agron. 1, Agr. Econ. 2, Soils 6)</p> <p>Agr. Econ. 141w,¹ Marketing Organization: Dairy and Poultry Products, 3
(Agr. Econ. 40)</p> <p>An. Husb. 112w, Animal Breeding, 3
(Agron. 131)</p> <p>Vet. 9w, Veterinary Studies, 3 (Bact. 41)</p> <p>Electives, 5</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Spring Quarter

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)</p> <p>Agr. Eng. 12s, Field Machinery, 3</p> <p>Agron. 123s, Forage Crops, 3 (Agron. 1, Bot. 10 cred.)</p> <p>Hort. 32s, Vegetable Growing, 3 (May be omitted if completed as a part of the general requirements)</p> <p>Electives, 5 or 8</p> | <p>Agr. Econ. 103s, Farm Operation, 3 (Agr. Econ. 102)</p> <p>Agr. Eng. 7s, Farm Structures I, 3 Agr. Eng. 3)</p> <p>An. Husb. 113s, Livestock Management, 3
(An. Husb. 6, 112)</p> <p>Vet. 10s, Veterinary Studies, 3 (Vet. 9)</p> <p>Electives, 6</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

2. GENERAL CURRICULUM IN AGRICULTURAL EDUCATION

PREPARATION FOR TEACHING AGRICULTURE

Students who have completed the required work of the freshman and sophomore years of the College of Agriculture, or equivalent, may prepare to teach agriculture in the public schools by completing the junior and senior years in a combined curriculum of the College of Education and the College of Agriculture.

The agriculture requirements can be fulfilled by the major, minor, and elective plan (Method I) as shown on page 19, or by completing the suggested curriculum under Method II shown below.

The education requirements can be fulfilled by completing satisfactorily 24 quarter credits in Agricultural Education courses some of which are required courses. The following courses must be included: Agr. Ed. 11, 42, 181, 182, 183.

¹ Agr. Econ. 110f, Economics of Agricultural Production I, 3 (Agr. Econ. 2) may be substituted for this course.

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It is recommended that electives be chosen from the courses in Agricultural Education or from such of the subject-matter courses as will best complete a well-balanced and well-distributed preparation. In addition to those found in the suggested curriculum may be mentioned Agr. Eng. 12; Agron. 124, 132; For. 27; Pl. Path. 9; Poult. 1; Pub. and Rur. Journ. 19. Recommended electives in education: Agr. Ed. 135, 154, 161; Ed. Ad. 65T, 133, 167-168.

Graduates of the University of Minnesota completing these agriculture and education requirements will be eligible for the Minnesota "high school standard special" certificate for teaching agriculture and the sciences in high schools or elementary schools of this state.

Students desiring to obtain the teacher's certificate should consult an adviser in the Division of Agricultural Education during the freshman year to avoid difficulties that may otherwise arise in program making.

Below is found a suggested curriculum which, tho not required, may serve as a guide to students desiring a well-balanced preparation for teaching agriculture and the sciences, for serving as county agent, or for practical farming, and will facilitate making a program that will avoid conflicts.

JUNIOR YEAR

SENIOR YEAR

Fall Quarter

Agron. 121f, Grain Crops, 3 (Agron. 1, Bot. 10 cred.)
 An. Husb. 3f, Types and Breeds of Livestock, 3 (An. Husb. 1-2)
 Dy. Husb. 101f, Milk Production, 5 (Dy. Husb. 1)
 Hort. 6f, Fruit Growing, 3 (May be omitted if completed as a part of the general requirements)
 Electives, 3 or 6¹

Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)
 Agr. Ed. 181f, Teaching Agriculture, 5 (See Part II)
 Dy. Husb. 7f, Dairy Stock Selection, 2 (Dy. Husb. 101 or parallel)
 Pl. Path. 1f, Plant Pathology, 5 (Bot. 10 cred.)
 Electives, 3

Winter Quarter

Agron. 131f,w, Principles of Genetics, 3 (Bot. or Zool. 9 cred.)
 An. Husb. 4w, Types and Breeds of Livestock, 3 (An. Husb. 3)
 Ent. 63f,w, Economic Entomology, 3 (Zool. 16)
 Vet. 9w, Veterinary Studies, 3 (Bact. 41)
 Electives, 5

Agr. Econ. 102w, Farm Organization, 3 (Agron. 1, Agr. Econ. 2, Soils 6)
 Agr. Ed. 182w, Teaching Agriculture, 5 (See Part II)
 Sociol. 14f,w,s, Rural Sociology, 3 (Sociol. 1 or sr. class.)
 Electives, 5¹

Spring Quarter

Agr. Ed. 11f,w,s, Educ. Psychology, 3
 Agr. Eng. 40f,s, Mechanical Training I, 3
 Agron. 123s, Forage Crops, 3 (Agron. 1, Bot. 10 cred.)
 An. Husb. 8s, Fundamentals of Feeding and Management, 5
 Vet. 10s, Veterinary Studies, 3 (Vet. 9)

Agr. Econ. 103s, Farm Operation, 3 (Agr. Econ. 102)
 Agr. Ed. 42f,w,s, Supervised Teaching Experience, 3 (Agr. Ed. 182. See Part II)
 Agr. Ed. 183s, Teaching Agriculture, 5 (See Part II)
 Electives, 6¹

¹ At least 3 of the elective credits listed in the junior and senior years must be chosen in Agricultural Education.

3. GENERAL CURRICULUM IN AGRICULTURAL ECONOMICS

Opportunities for majoring in agricultural economics are offered in various lines. The best selection and sequence of courses depend upon the particular line which the student intends to follow. Students interested in majoring in this field are requested to consult with the division in working out a program of courses suited to their needs.

4. GENERAL CURRICULUM IN AGRICULTURAL ENGINEERING

Suggested for those who intend to prepare for general farming, with emphasis on engineering. Students desiring a professional curriculum in Agricultural Engineering are referred to the outline on pages 30 and 31.

JUNIOR YEAR

SENIOR YEAR

Fall Quarter

Agr. Eng. 37f,w, Rural Sanitation, 3
Agron. 121f, Grain Crops, 3 (Agron. 1, Bot. 10 cred.)
An. Husb. 3f, Types and Breeds of Livestock, 3 (An. Husb. 1-2)
Pl. Path. 1f, Plant Pathology, 5 (Bot. 10 cred.)
Electives, 3

Agr. Eng. 19f, Elementary Surveying, 3 (Agr. Eng. 3, 11 or equiv.)
Agr. Eng. 24f, Agricultural Physics I, 4 (Math. 4 or equiv.)
Agron. 131f,w, Principles of Genetics, 3 (Bot. or Zool. 9 cred.)
Dy. Husb. 7f, Dairy Stock Selection, 2 (Dy. Husb. 101 or parallel)
Dy. Husb. 101f, Milk Production, 5 (Dy. Husb. 1)

Winter Quarter

Agr. Eng. 5w, Farm Building Design and Construction, 3
Agr. Eng. 31w,s, Principles of Drainage, 3
Agron. 122w, Grain and Hay Grading, 3 (Agron. 1, Bot. 10 cred.)
An. Husb. 4w, Types and Breeds of Livestock, 3 (An. Husb. 3)
Ent. 63f,w, Economic Entomology, 3 (Zool. 16)
Electives, 2

Agr. Econ. 102w, Farm Organization, 3 (Agron. 1, Agr. Econ. 2, Soils 6)
Agr. Eng. 25w, Agricultural Physics II, 4 (Agr. Eng. 24)
An. Husb. 112w, Animal Breeding, 3 (Agron. 131)
Sociol. 14f,w,s, Rural Sociology, 3 (Sociol. 1 or sr. class.)
Electives, 4

Spring Quarter

Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)
Agr. Eng. 7s, Farm Structures I, 3 (Agr. Eng. 3, 5)
Agr. Eng. 12s, Field Machinery, 3
Agr. Eng. 13f,s, Gas Engines, 3
An. Husb. 8s, Fundamentals of Feeding and Management, 5

Agr. Econ. 103s, Farm Operation, 3 (Agr. Econ. 102)
Agr. Econ. 142s, Marketing Organization: Fruits and Vegetables, 3 (Agr. Econ. 40)
Agr. Eng. 14f,s, Tractors, 3 (Agr. Eng. 13)
Electives, 8

5. GENERAL CURRICULUM IN ANIMAL HUSBANDRY

For those who aim to make a special study of livestock as a preparation for (a) various phases of livestock farming, for (b) the technical positions relating to livestock, and for (c) further study in graduate work when

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the student desires to prepare for college, experiment station, and government research and similar positions requiring a still greater degree of specialization.

JUNIOR YEAR

Fall Quarter

Agr. Biochem. 6f, Animal Biochemistry, 5
(Agr. Biochem. 4, Soils 6)
Agron. 131f,w, Principles of Genetics, 3
(Bot. or Zool. 9 cred.)
An. Husb. 3f, Types and Breeds of Livestock, 3 (An. Husb. 1-2)
Vet. 2f, Comparative Anatomy and Physiology of Domestic Animals, 3
Electives, 3

SENIOR YEAR

Agr. Econ. 40f,s, Principles of Marketing Organizations, 3 (Agr. Econ. 2)
An. Husb. 7f, Meats, 3 (An. Husb. 3-4)
An. Husb. 101f, Advanced Stock Judging, 3 (An. Husb. 5)
An. Husb. 115f, The Marketing of Livestock, 3 (An. Husb. 3-4)
Vet. 6f, Physiology of Reproduction, 4 (Vet. 2-3-4)
Elective, 1

Winter Quarter

An. Husb. 4w, Types and Breeds of Livestock, 3 (An. Husb. 3)
An. Husb. 112w, Animal Breeding, 3 (Agron. 131)
Vet. 3w, Comparative Anatomy and Physiology of Domestic Animals, 3 (Vet. 2)
Electives, 8

Agr. Econ. 143w,¹ Marketing Organization: Livestock and Meats, 2 (Agr. Econ. 40)
An. Husb. 6w, Livestock Feeding, 5 (Agr. Biochem. 6)
Electives, 10

Spring Quarter

Agron. 123s, Forage Crops, 3 (Agron. 1, Bot. 9 cred.)
An. Husb. 5s, Livestock Judging, 3 (An. Husb. 3-4)
Vet. 4s, Comparative Anatomy and Physiology of Domestic Animals, 3 (Vet. 3)
Electives, 8

An. Husb. 113s, Livestock Management, 3 (An. Husb. 3-4)
Electives, 14

6. GENERAL CURRICULUM IN DAIRY HUSBANDRY

Recommended for those students who plan definitely to engage in dairy farming or in some practical branch of dairy production.

JUNIOR YEAR

Fall Quarter

Agr. Biochem. 6f, Animal Biochemistry, 5
(Agr. Biochem. 4, Soils 6)
An. Husb. 3f, Types and Breeds of Livestock, 3 (An. Husb. 1-2)
Dy. Husb. 7f, Dairy Stock Selection, 2 (Dy. Husb. 101 or parallel)
Dy. Husb. 101f, Milk Production, 5 (Dy. Husb. 1)
Vet. 2f, Comparative Anatomy and Physiology of Domestic Animals, 3

SENIOR YEAR

Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)
Agron. 121f, Grain Crops, 3 (Agron. 1, Bot. 10 cred.)
Dy. Husb. 105f, Seminar I, 1 (3 courses in dy. husb.)
Pl. Path. 1f, Plant Pathology, 5 (Bot. 10 cred.)
Electives, 5

¹ Agr. Econ. 110f, Economics of Agricultural Production I, 3 (Agr. Econ. 2) may be substituted for this course.

Winter Quarter

Agron. 131f,w, Principles of Genetics, 3 (Bot. or Zool. 9 cred.)	Agr. Econ. 102w, Farm Organization, 3 (Agron. 1, Agr. Econ. 2, Soils 6)
An. Husb. 4w, Types and Breeds of Live- stock, 3 (An. Husb. 3)	An. Husb. 112w, Animal Breeding, 3 (Agron. 131)
Dy. Husb. 3w, Dairy Bacteriology, 3 (Bact. 41)	Dy. Husb. 103w, Dairy Stock Feeding, 3 (Dy. Husb. 101, Agr. Biochem. 6)
Geol. 8f,w,s, Introductory Geology, 5	Dy. Husb. 106w, Seminar II, 1 (3 courses in dy. husb.)
Vet. 3w, Comparative Anatomy and Physi- ology of Domestic Animals, 3 (Vet. 2)	Ent. 63f,w, Economic Entomology, 3 (Zool. 16)
	Poult. 1f,w, Poultry, 3

Spring Quarter

Agr. Econ. 101s, Farm Management, 3 (Agron. 1, Agr. Econ. 2)	Agr. Econ. 103s, Farm Operation, 3 (Agr. Econ. 102)
Agron. 123s, Forage Crops, 3 (Agron. 1, Bot. 10 cred.)	Agr. Econ. 104s, Types of Farming, 3 (Agr. Econ. 103)
Dy. Husb. 104s, Dairy Cattle Breeding, 3 (Dy. Husb. 7, 101, Agron. 131)	Agr. Eng. 40f,s, Mechanical Training I, 3
Sociol. 1f,w,s, Introduction to Sociology, 3	An. Husb. 113s, Livestock Management, 3 (An. Husb. 3-4)
Vet. 4s, Comparative Anatomy and Physi- ology of Domestic Animals, 3 (Vet. 3)	Electives, 5
Electives, 2	

7. GENERAL CURRICULUM IN DAIRY PRODUCTS

Those desiring to specialize in dairy products may enter the Agricultural Science curriculum beginning with the freshman year or pursue the general requirements for the Technical Agricultural curriculum. In either case specialization will begin with the junior year. Major groups will be arranged to include suitable courses from the general curriculum in Dairy Husbandry and from the following of special importance to the dairy products field:

Agr. Biochem. 6, 101, 102, 103

Agr. Econ. 25, 40, 102, 103, 131, 140, 141

Agr. Eng. 24, 25, 40, 41, 70

Dy. Husb. 2, 4, 101, 102, 105, 110, 111, 112, 113, 115

The minor may be in Agricultural Economics or Agricultural Biochemistry.

8. CURRICULUM IN FUR FARMING

Fur farming has recently developed into an established type of farming industry in Minnesota. The growth has been so rapid that it has not been possible to assemble and classify the experiences of successful and unsuccessful farms or to obtain by careful experimental investigations the same kind of scientific information which long established types of farming, such as dairy husbandry, enjoy. There is, nevertheless, an insistent demand for college training in this field, and within the colleges of the University many courses of study are available which contribute valuable information or basic principles of use to prospective fur farmers.

The Minnesota Agricultural Experiment Station is using every available opportunity to develop experiments and to collect information on this new

type of agricultural industry. The following curriculum is offered as the best available at present in the University of Minnesota. While only a limited number of subject-matter courses deal directly with the practical phases of fur farming, all of the suggested courses have at least an indirect bearing on this type of farming. A completely detailed curriculum cannot be suggested at present and the student must build his course by the open elective method under the guidance of an adviser. The subject-matter courses of the junior-senior years have been carefully selected from all university departments offering information and training applicable or basic to fur farming.

FRESHMAN-SOPHOMORE YEARS

Same as for Technical Agricultural curriculum. Substitutions may be made for one or more of the following courses upon the approval of the adviser: Agron. 1, Hort. 6, An. Husb. 1-2, Dy. Husb. 1.

Major, minor, and elective courses may be selected from the following:

JUNIOR YEAR

Agr. Biochem. 6f, Animal Biochemistry, 5 (Agr. Biochem. 4, Soils 6)
 Agr. Econ. 7w, Natural Resources, 3
 Agron. 131f,w, Principles of Genetics, 3 (Bot. or Zool. 9 cred.)
 Ent. 63f,w, Economic Entomology, 3 (Zool. 16)
 Ent. 64w, Economic Vertebrate Zoology, 3 (Zool. 14-15)
 Ent. 67, Varieties and Habits of Fur Bearing Animals, 3 (Zool. 9 cred.)
 Vet. 2f-3w-4s, Comparative Anatomy and Physiology of Domestic Animals, 9
 Vet. 6f, Physiology of Reproduction, 4 (Vet. 2-3-4)
 Vet. 12w, Infectious Diseases, 3 (Vet. 2-3-4, Bact. 41)
 Zool. 51f, Introductory Parasitology, 5 (Zool. 14-15 or equiv.)

SENIOR YEAR

Agr. Biochem. 116w, Advanced Animal Nutrition, 3 (Agr. Biochem. 6, and 111 or physiologic chem.)
 Agr. Biochem. 117f,w,s, Laboratory Problems in Animal Nutrition, 3 (Agr. Biochem. 116, instructor's permission)
 Agr. Econ. 101s, Farm Management, 3 (Agr. Econ. 2, Agron. 1)
 Agr. Econ. 102w, Farm Management: Organization, 3 (Agr. Econ. 2, Agron. 1, Soils 6)
 An. Husb. 112w, Animal Breeding, 3 (Agron. 131)
 Zool. 144f,s-145w-146s, Animal Parasites and Parasitism, 9 (15 cred. in zool. or Zool. 1-2-3 and 1 yr. chem.)
 Special lectures on fur farming will be arranged if possible.

Electives are suggested from the following departments:

Agricultural Economics, Agricultural Engineering, Bacteriology, Economics, Entomology and Economic Zoology, Horticulture, Plant Pathology and Botany, Poultry Husbandry, Soils, and Zoology

9. GENERAL CURRICULUM IN HORTICULTURE

A foundation curriculum suggested for those who purpose to engage in the production of horticultural crops or to enter into some horticultural business.

JUNIOR YEAR

SENIOR YEAR

Fall Quarter

Agron. 121f,¹ Grain Crops, 3 (Agron. 1, Bot. 10 cred.)
 Agron. 131f,w, Principles of Genetics, 3 (Bot. or Zool. 9 cred.)
 Hort. 6f, Fruit Growing, 3 (May be omitted if completed as a part of the general requirements.)
 Pl. Path. 1f, Plant Pathology, 5 (Bot. 10 cred.)
 Electives, 3 or 6

Agr. Econ. 13f,s, Gas Engines, 3, or Agr. Eng. 40f,s, Mechanical Training, 3
 Hort. 93f, Judging Horticultural Crops, 2 (Hort. 6 or 32)
 Hort. 107f, Orchard Mgt., 3 (Hort. 6)
 Hort. 135f, Truck Crops and Potatoes I, 3 (Hort. 32, Bot. 10 cred.)
 Hort. 193f, Horticultural Seminar, 1 (Hort. 9 cred.)
 Electives, 5

Winter Quarter

Ent. 63f,w, Economic Entomology, 3 (Zool. 16)
 Hort. 121w, Small Fruit Culture, 3 (Hort. 6 or 32, Bot. 10 cred.)
 Hort. 56, Plant Propagation and Nursery Practice, 3 (Bot. 10 cred.)
 Electives, 8

Agr. Econ. 102w, Farm Organization, 3 (Agron. 1, Agr. Econ. 2, Soils 6)
 Hort. 110w, Horticultural Crop Breeding, 3 (Agron. 131)
 Hort. 137w, Truck Crops and Potatoes II, 3 (Hort. 32, Bot. 10 cred.)
 Hort. 194w, Hort. Seminar, 1 (Hort. 193)
 Electives, 7

Spring Quarter

Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)
 Bot. 22f,w,s, Elementary Plant Physiology, 3 (Bot. 1)
 Hort. 32s, Vegetable Growing, 3 (May be omitted if completed as a part of the general requirements.)
 Hort. 72s, Woody Plants and Garden Flowers, 2 (Bot. 10 cred.)
 Pl. Path. 112s, Diseases of Fruit Crops, 3 (Pl. Path. 1 or 10) or
 Pl. Path. 113s, Diseases of Vegetable Crops, 3 (Pl. Path. 1 or 10)
 Electives, 3 or 6

Agr. Econ. 142s,² Marketing Organization: Fruits and Vegetables, 3 (Agr. Econ. 40)
 Agr. Eng. 12s, Field Machinery, 3 or Agron. 132w, Farm Crops Plant Breeding, 3 (Agron. 131)
 Sociol. 14f,w,s, Rural Sociology, 3 (Soc. 1 or sr. class.)
 Electives, 8

10. GENERAL CURRICULUM IN LANDSCAPE GARDENING

A suggested curriculum for students majoring in landscape gardening. Slight deviations may be allowed on recommendation of adviser.

JUNIOR YEAR

SENIOR YEAR

Fall Quarter

Agr. Eng. 19f, Elementary Surveying, 3 (Agr. Eng. 3, 11, or equiv.)
 Arch. 31f, Elements of Architecture, 3
 Hort. 6f, Fruit Growing, 3 (May be omitted if completed as a part of general requirements.)
 Hort. 71f, Plant Materials I, 2 (Bot. 10 cred.)
 Hort. 93f, Judging Horticultural Crops, 2 (Hort. 6 or 32)
 Electives, 4 or 7

Agron. 131f,w, Principles of Genetics, 3 (Bot. or Zool. 9 cred.)
 Arch. 14f, History of Architecture, 2 (Arch. 33)
 Hort. 193f, Horticultural Seminar, 1 (Hort. 9 cred.)
 Pl. Path. 1f, Plant Pathology, 5 (Bot. 10 cred.)
 Electives, 6

¹ Agronomy 123s, Forage Crops, 3 (Agron. 1, Bot. 10 cred.) may be substituted for this course.

² Agr. Econ. 110f, Economics of Agricultural Production I, 3 (Agr. Econ. 2) may be substituted for this course.

Winter Quarter

Arch. 32w, Elements of Architecture, 3 (Arch. 31)	Arch. 15w, History of Architecture, 2 (Arch. 14)
Ent. 63f,w, Economic Entomology, 3 (Zool. 16)	Hort. 110w, Horticultural Crop Breed- ing, 3 (Agron. 131)
Hort. 56, Plant Propagation, 3 (Bot. 10 cred.)	Hort. 191w, Special Problems, 3 (Hort. 190)
Hort. 74w, Landscape Design, 3 (Hort. 71, Arch. 21 or Agr. Eng. 3)	Hort. 194w, Horticultural Seminar, 1 (Hort. 9 cred.)
Electives, 5	Electives, 8

Spring Quarter

Arch. 33f,s, Elements of Architecture, 3 (Arch. 32)	Arch. 16s, History of Architecture, 2 (Arch. 15)
Hort. 32s, Vegetable Growing, 3 (May be omitted if completed as a part of general requirements.)	Hort. 76s, Landscape Construction, 3 (Hort. 74)
Hort. 50, Floriculture, 3	Hort. 192s, Special Problems, 3 (Hort. 191)
Hort. 72s, Woody Plants and Garden Flowers, 2 (Bot. 10 cred.)	Pl. Path. 112s, Diseases of Fruit Crops, 3 (Pl. Path. 1 or 10) or
Electives, 6 or 9	Pl. Path. 114s, Advanced Forest Pa- thology, 3 (Pl. Path. 1 or 10)
	Electives, 6

AGRICULTURAL SCIENCES

Opportunity is offered to students who have completed the required courses of the Technical Agricultural curriculum and who desire to specialize in the various branches of agriculture and agricultural sciences. Students who desire such specialization are advised, however, to follow the requirements of the Agricultural Science curriculum from the beginning of the freshman year. In all cases it is assumed that such students will spend one or more years in graduate study. Only those students who have had high scholarship records in their undergraduate curriculum and who have a clear understanding of the study to be pursued and who have a lasting and abiding enthusiasm for the chosen field of specialization should enter upon these curricula. Since a comparatively small number of students will enter these special curricula and since the specialization may vary considerably even in one field with the individual student, complete curricula are not suggested in all lines.

Students in these curricula may prepare themselves for teaching in colleges and universities, for research and experimental work in experiment stations, for regulatory, experimental, and extension service in the state and federal departments of agriculture, and for various technical and industrial positions in agricultural industries and in the industries related to agriculture. For the opportunities offered, the student is advised to consult with the various divisions and with the dean of the college.

Students are advised to construct a curriculum in accordance with the open elective system (Method I, page 19) including as many of the subjects listed under the General Curriculum in Agriculture as are consistent with their special curriculum. The attention of the student is also called to the

modern language requirements for graduate students. In many divisions French or German is required for the Master's degree and in all cases both French and German are required for a degree of doctor of philosophy. At least one modern language should be obtained during the undergraduate work.

The divisions offering such opportunities for specialization are listed below. In each case the student should consult with the division in the selection of his major, minor, and electives.

- | | |
|------------------------------------|-----------------------------------------------|
| 1. Agricultural Biochemistry | 6. Farm Management and Agricultural Economics |
| 2. Agronomy and Plant Genetics | 7. Horticulture |
| 3. Animal Husbandry | 8. Plant Pathology and Botany |
| 4. Dairy Husbandry | 9. Soils |
| 5. Entomology and Economic Zoology | 10. Veterinary Medicine |

B. AGRICULTURAL SCIENCE CURRICULUM

This curriculum requires 192 credit hours for graduation and is made up of (1) required courses with such options as are indicated in the freshman and sophomore years, and (2) a major and electives in the junior and senior years.

FRESHMAN YEAR

- Non-credit courses* required for graduation in addition to the 192 credit hours. Freshman Assembly. A course of lectures offered only in the fall quarter. Mil. Sci. 1f-2w-3s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education. Phys. Ed. 4w, Freshman Hygiene or Prev. Med. 3f,w,s, Personal Hygiene and Elementary Sanitation, 2.
- General courses.*—The following courses may be registered for any quarter that they are offered except that the proper sequence of continuation courses and the prerequisites must be observed.
 - Bot. 1f,w,s, General Botany, 4, and 6 cred. selected from the following: Bot. 2, 5, 7, 12, 13, 21, 22; or Zool. 14f-15w-16s, General Zoology, 9
 - Inorg. Chem. 1f-2w-3s, General Inorganic Chemistry, 12. Students presenting a year of high school chemistry may omit this course and register for Inorg. Chem. 9-10. Those required to take this course because of inability to carry successfully Inorg. Chem. 9-10 will be allowed not more than 10 credits.
 - Inorg. Chem. 9f,w-10w,s, Advanced General Inorganic Chemistry, 10 (1 yr. h. s. chem.). Those required to take Inorg. Chem. 1-2-3 may omit this course.
 - Math. 5f,w,s, Higher Algebra, 5; Math. 6f,w,s, Trigonometry, 5 (Math. 5 or equiv.); and Math. 7f,w,s, College Algebra, 5 (Math. 6) or modern language, 15
 - Rhetoric 1f,w,s-2w,s,f-3s,f,w, Rhetoric, 9

SOPHOMORE YEAR

- Non-credit courses* required for graduation in addition to the 192 credit hours. Mil. Sci. 4f-5w-6s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.
- General courses.*—The following courses may be registered for any quarter that they are offered, except that the proper sequence of continuation courses and the prerequisites must be observed.
 - Agr. Biochem. 4f, Introduction to Organic and Biochemistry, 5 (Inorg. Chem. 10 cred.)
 - Agr. Biochem. 5s, Plant Biochemistry, 5 (Agr. Biochem. 4, Soils 6); or Agr. Biochem. 6f, Animal Biochemistry, 5 (Agr. Biochem. 4, Soils 6)

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- Agr. Econ. 1f,w, Principles of Economics I, 3
Agr. Econ. 2w,s, Principles of Economics II, 5 (Agr. Econ. 1)
Bot. 1f,w,s, General Botany, 4 and 6 cred. selected from the following: Bot. 2, 5, 7, 12, 13, 21, 22; or Zool. 14f-15w-16s, General Zoology, 9
Bact. 41f,w,s, General Bacteriology, 5 (chem., zool.)
Math. 5f,w,s, Higher Algebra, 5; Math. 6f,w,s, Trigonometry, 5 (Math. 5 or equiv.); and Math. 7f,w,s, College Algebra, 5 (Math. 6) or modern language, 15
Rhet. 11f,w,s, Argumentation, 3 (Rhet. 3, Rhet. 22 advised) or Rhet. 22f,w,s, Public Speaking, 3 (Rhet. 3)
Soils 6w, Soils, 5 (Agr. Biochem. 4)

JUNIOR AND SENIOR YEARS

1. A major sequence of 24 to 36 credits from one of the following fields:
 - a. Agricultural Biochemistry
 - b. Agronomy
 - c. Entomology and Economic Zoology
 - d. Horticulture
 - e. Nutrition
 - f. Plant Breeding
 - g. Plant Pathology
 - h. Soils
2. A minor sequence of 12 credits to be chosen outside the major field of work.
3. Electives sufficient to make a total of 192 credit hours for the four years of work of which at least 21 credit hours must be in technical agriculture or in sciences fundamental thereto.

C. AGRICULTURAL ENGINEERING

(Professional Curriculum)

This curriculum leads to the degree of bachelor of agricultural engineering and is offered jointly by the College of Agriculture, Forestry, and Home Economics, and the College of Engineering and Architecture. Three distinct lines of specialization are provided, namely, Farm Buildings, Farm Machinery, and Reclamation. (See also general curriculum in Agricultural Engineering for students in Agriculture who desire to major in this field, page 23.)

FRESHMAN YEAR

During the freshman year those following this curriculum will register in the College of Engineering and Architecture and follow the work of the freshman year as outlined in the bulletin of that college.

SOPHOMORE YEAR

The following courses should be scheduled for the quarter as indicated below. For the last three years of the curriculum students are registrants both of the College of Agriculture, Forestry, and Home Economics, and the College of Engineering and Architecture.

1. *Non-credit courses* required for graduation.

Agr. Eng. 91f, 92w, 93s, Agendum
Mil. Sci. 4f-5w-6s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.
2. *General courses.*

Agr. Biochem. 4f, Introduction to Organic and Biochemistry, 5 (Inorg. Chem. 10 cred.)
Agr. Eng. 5w, Farm Building Design and Construction, 3
Agr. Eng. 7s, Farm Structures I, 3 (Draw. 3 or equiv.)
Agr. Eng. 12s, Field Machinery, 3
Agr. Eng. 13f,s, Gas Engines, 3
Agr. Eng. 19f-20s, Surveying, 6 (Draw. 3 and M. & M. 12, or equiv.)

Agr. Eng. 43f, Mechanical Laboratory, 3
 Hort. 6f, Fruit Growing, 3
 M. & M. 24f,w,s, Differential Calculus, 5 (M. & M. 13)
 M. & M. 25f,w,s, Integral Calculus, 5 (M. & M. 24)
 M. & M. 84f,s, Technical Mechanics, 5 (M. & M. 25)
 Phys. 3f,w,s, Elements of Mechanics, 3 (M. & M. 12 or equiv.)
 Phys. 4f,w,s, Elements of Mechanics Laboratory, 1 (Phys. 3 or parallel)
 Phys. 43w,s, Electricity, 3 (Phys. 3)
 Phys. 44w,s, Electricity Laboratory, 1 (Phys. 43 or parallel)
 Soils 6w, Soils 5 (Agr. Biochem. 4)

JUNIOR YEAR

SENIOR YEAR

Fall Quarter

<p>Agr. Eng. 14f,s, Tractors, 3 (Agr. Eng. 13) Agr. Eng. 71f, Power Machinery, 3 (Agr. Eng. 12, 13) Agr. Eng. 94f, Agendum Econ. 8f, General Economics, 3 M. & M. 128f,w,s, Strength of Materials, 5, (M. & M. 84) Phys. 23f,w, Heat, 3 (Phys. 3) Phys. 24f,w, Heat Laboratory, 1 (Phys. 23 or parallel)</p>	<p>Agr. Eng. 70f, Steam Boilers and Engines, 3 (Phys. 23, 24) Agr. Eng. 97f, Agendum C.E. 51f, Highways and Pavements, 3 (Agr. Eng. 20) C.E. 146f,w,s, Plain Concrete, 3 Geol. 5f, Engineering Geology, 3 Rhet. 22f,w,s, Public Speaking, 3 (Rhet. 3) Electives, 2</p>
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Winter Quarter

<p>Agr. Eng. 37f,w, Rural Sanitation, 3 Agr. Eng. 95w, Agendum Econ. 9w, General Economics, 3 (Econ. 8) M. & M. 86w, Hydraulics, 2 (M. & M. 84) M. & M. 143f,w,s, Hydraulics Laboratory, 1 (M. & M. 84) M. E. 26f,w,s, Mechanism and Kinematics, 3 (Draw. 27, M. & M. 24) Soils 108w, Physical Properties of Soils, 3 (Soils 6) or Agr. Eng. 72w, Applied Electricity, 3 (Phys. 43, 44 or equiv.) Electives, 1</p>	<p>Agr. Econ. 102w, Farm Organization, 3 (Agr. Econ. 2, Soils 6) Agr. Eng. 72w, Applied Electricity, 3 (Phys. 43, 44 or equiv.) or Soils 108w, Physical Properties of Soils, 3 (Soils 6) Agr. Eng. 98w, Agendum G.E. 101w, Contracts and Specifications, 3 Electives, 5</p>
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Spring Quarter

<p>Agr. Eng. 31w,s, Principles of Drainage, 3 Agr. Eng. 42s, Principles of Irrigation, 3 Agr. Eng. 96s, Agendum Agron. 1f,s, General Farm Crops, 3 or An. Husb. 15s, Fundamentals of Livestock Production, 3 C. E. 37s, Structural Engineering, 3 (M. & M. 128) Econ. 28f,s, Business Law, 3 M. E. 27s, Machine Design, 3 (M. E. 23)</p>	<p>Agr. Econ. 103s, Farm Operation, 3 (Agr. Econ. 102) Agr. Eng. 99s, Agendum Agr. Eng. 150s, Seminar, 2 (3rd qtr. sr.) Agron. 1f,s, General Farm Crops, 3 or An. Husb. 15s, Fundamentals of Livestock Production, 3 G. E. 193s, Engineering Practice, 2 (sr.) Electives, 7</p>
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RECOMMENDED ELECTIVES

1. *Farm Structures*
 Agr. Eng. 67, 111, 112, 113; For. 27.
2. *Farm Machinery and Power*
 Agr. Eng. 15, 28, 121, 122, 123, 126; E.E. 43, 44, 45.
3. *Reclamation*
 Agr. Eng. 28, 68, 69, 101, 102, 103; C.E. 161; Hort. 77.

D. AGRICULTURAL BUSINESS ADMINISTRATION
CURRICULUM

This curriculum offers an opportunity for those who wish to prepare specifically for some branch of agricultural business, such as the marketing of farm products, farm finance, farm implements, farm real estate, country merchandising, and the like. The first two years are prescribed and include introductory courses in agriculture, economics, and the fundamental sciences necessary for further work in agriculture and economics. During the freshman and sophomore years, students will register in the College of Agriculture, Forestry, and Home Economics. In the junior and senior years the student will register in both the School of Business Administration and the College of Agriculture, Forestry, and Home Economics. At least 90 credits and honor points equal to the number of credits are required for admission to the junior class. For definition of "honor point" see page 12. Approximately one third of the last two years is elective and may include approved courses in any college as well as advanced courses in agriculture and economics. The fees for the first two years are those for the College of Agriculture, Forestry, and Home Economics. For the last two years the fees are those of the School of Business Administration.

FRESHMAN YEAR

The freshman year consists of the regular freshman courses outlined on pages 17 and 18, except that students are advised to take Math. 8 rather than Agr. Eng. 11; or Math. 5 if they do not have the prerequisites for Math. 8. If any course of the freshman year is deferred, it should be An. Husb. 10-11, to the sophomore year.

SOPHOMORE YEAR

The following courses should be scheduled for the quarters as indicated.

1. *Non-credit courses* required for graduation.
Mil. Sci. 4f-5w-6s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.
2. *Freshman courses* which were not completed during the freshman year.
3. *General courses*
Agr. Econ. 1f,w, Principles of Economics I, 3
Agr. Econ. 2w,s, Principles of Economics II, 5 (Agr. Econ. 1)
Agr. Econ. 8s, Rural Economics, 3 (Agr. Econ. 1)
Agr. Econ. 50s, Farm Finance, 5 (Agr. Econ. 2)
¹Econ. 20f,w,s, Elements of Accounting, 3
Econ. 25f,w-26w,s, Principles of Accounting, 6
Psychology 1f-2w, General Psychology for Business Students, 6
Zool. 14f-15w-16s, General Zoology, 9
4. *Electives*.—Enough elective credits should be selected to make with the required work of the freshman and sophomore years a total of 101 credit hours.

JUNIOR YEAR

1. *General Requirements*
Bus. Adm. 51f-52w-53s, Business Law, 9 (10 cred. in pol. sci. or 10 cred. in econ. or 5 cred. in each)
Bus. Adm. 100f,w,s, Report Writing, 1 (To be taken in connection with Econ. 141)
Econ. 141f,w,s, Monetary and Banking Policies, 3 (Econ. 3 and 4 or 6-7)

¹ Students who have had a high school course or experience in bookkeeping may be exempted from this course and admitted to Econ. 25-26 by passing a placement test.

2. *Special Requirements*

- Agr. Econ. 30f, Prices of Farm Products, 3 (Agr. Econ. 2)
- Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)
- Agr. Econ. 90f, Agricultural Statistics, 5 (Agr. Econ. 2)
- Agr. Econ. 110f-111w, Economics of Agricultural Production, 6 (Agr. Econ. 2)
- Agr. Econ. 131w, Market Prices, 3 (Agr. Econ. 40)
- Agr. Econ. 141w, Marketing Organization: Dairy and Poultry Products, 3 (Agr. Econ. 40)
- Agr. Econ. 142s, Marketing Organization: Fruits and Vegetables, 3 (Agr. Econ. 40)

SENIOR YEAR

1. *General Requirements*

- Bus. Adm. 58f,w,s, Public Finance, 3
- Bus. Adm. 71f,w,s, Traffic Management, 3
- Bus. Adm. 101f,w-102w,s, Advanced General Economics, 6 (Econ. 4 or 6-7)
- Bus. Adm. 139f,w,s, Advanced General Accounting, 3 (Econ. 25-26)
- Econ. 149f,w,s, Business Cycles, 3 (Econ. 3 and 4 or 6-7)

2. *Special Requirements*

- Agr. Econ. 135s, Methods of Price Analysis, 3 (Agr. Econ. 30, 191)
- Agr. Econ. 150s, Advanced Farm Finance, 3 (Agr. Econ. 50 or Econ. 3)
- Agr. Econ. 170s, Land Economics, 3 (Agr. Econ. 110)
- Agr. Econ. 191w, Advanced Agricultural Statistics, 3 (Agr. Econ. 90)

E. AGRICULTURAL JOURNALISM CURRICULUM

This curriculum is intended for those who wish to prepare for some branch of journalism which relates to agriculture: such as staff positions on agricultural magazines, writing on agricultural questions, editing of bulletins for state and federal departments of agricultural and experimental stations, editing of special farm pages or departments for newspapers, and editing of publications for farm organizations. The first two years are prescribed and include introductory courses in agriculture, journalism and economics. During the freshman and sophomore years, students will register in the College of Agriculture, Forestry, and Home Economics, and during the junior and senior years, will become registrants in both the College of Agriculture, Forestry, and Home Economics and the College of Science, Literature, and the Arts.

FRESHMAN YEAR

The freshman year consists of the regular freshman courses outlined on pages 17 and 18 except that English A-B-C should be substituted for Rhetoric 1-2-3.

SOPHOMORE YEAR

- Mil. Sci. 4-5-6, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.
- Agr. Econ. 1f,w-2w,s, Principles of Economics I-II, 8
- Agr. Econ. 8s, Rural Economics, 3 (Agr. Econ. 1)
- Engl. 11f,w,s-12w,s, Description and Narration, 6 (A-B-C, or 4-5-6 or exemption from requirement)
- Jour. 13f, Introduction to Reporting, 3 (Engl. A-B C, Comp. 4-5-6 or exemption)
- Jour. 14w-15s, Newspaper Reporting, 6 (13 or practical experience, and Comp. 11-12 or 18-19)
- Psy. 1f-2w, General Psychology (for business students) 6
- Zool. 14f-15w-16s, General Zoology, 9

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JUNIOR YEAR

Agr. Econ. 40f,s, Principles of Marketing Organization, 3 (Agr. Econ. 2)
Agr. Econ. 90f, Agricultural Statistics, 3 (Agr. Econ. 2)
Agr. Econ. 110f-111w, Economics of Agricultural Production, 6 (Agr. Econ. 2)
Jour. 51f-52w, News Editing, 6 (Jour. 15)
Jour. 55f,w,s, Advertising and Newspaper Typography, 3 (Jour. 51)
Jour. 69s, Newspaper and Magazine Articles, 3
Sociol. 1f,w,s, Introduction to Sociology, 5
Sociol. 14f,w,s, Rural Sociology, 3 (Sociol. 1 or sr. class.)

SENIOR YEAR

Agr. Econ. 30f, Prices of Farm Products, 3 (Agr. Econ. 2)
Agr. Econ. 135s, Methods of Price Analysis, 3 (Agr. Econ. 30, 191)
Econ. 149f,w,s, Business Cycles, 3 (Econ. 3 and 4 or 6-7)
Jour. 60f-61w-62s, The Weekly Newspaper, 9 (Jour. 15)
Pub. and Rur. Jour. 10f-11w-12s, Agricultural Journalism, 9 (Jour. 13-14-15, 51-52)
Psy. 56w, Psychology of Advertising, 3 (Psy. 1-2 and Prin. of Econ.)

RECOMMENDED ELECTIVES

Agr. Econ. 25, 126, 170; Agr. Ed. 11, 75; For. 1; Geog. 11; Jour. 70-71; Pol. Sci. 1, 2; Sociol. 110, 114

MINOR IN JOURNALISM

For students in the various divisions of the College of Agriculture, Forestry, and Home Economics wishing a short course in journalistic writing, elections from the following program are recommended:

Engl. Comp. 11-12; Jour. 13, 41, 69, 70-71.

For students majoring in home economics, Jour. 65 is recommended.

CURRICULA IN FORESTRY

Six curricula are offered to students whose major is in forestry. These are:

- A. General Forestry Curriculum
- B. Commercial Lumbering Curriculum
- C. Forest Technology Curriculum
- D. Grazing Curriculum
- E. Game Management Curriculum
- F. Forest Sciences Curriculum

Each curriculum is made up of 204 credit hours of work.

GENERAL REQUIREMENTS

All students, irrespective of the curriculum which they may select, are required to complete certain general courses before graduation. These are considered fundamental and necessary to any curriculum in forestry. For some students the outline for the first two years, given below, represents more than the regular amount of work of 17 credit hours per quarter. In such cases those subjects which cannot be taken in the freshman and sophomore years must take precedence the following year. Phys. Ed. 1-2-3, Gymnasium, 3 (credit is allowed only when the three quarters together with Course 4 are completed) may be taken in addition to the regular schedule if desired. Care should be taken in registration to give precedence to courses offered in only one quarter.

Not more than one half of the listed credit will be allowed for the courses listed under the freshman and sophomore years, below, unless completed prior to classification as a senior, except in the case of students transferring with at least one full year of advanced standing from a college where these courses were not available.

During the first two years the work in all curricula is essentially the same, and is devoted largely to the study of general courses. Preferably at the beginning of the sophomore year, and not later than the junior year, each student must decide upon the curriculum he wishes to follow.

FRESHMAN YEAR

1. *Non-credit courses* required for graduation in addition to the 204 credit hours.
Freshman Assembly. A course of lectures offered only in the fall quarter.
Mil. Sci. 1f-2w-3s, Basic Course. Students found to be physically unfit may be required to substitute corrective exercises in physical education.
Phys. Ed. 4w, Freshman Hygiene or Prev. Med. 3f,w,s, Personal Hygiene and Elementary Sanitation, 2
2. *General courses.*—The following courses may be registered for any quarter that they are offered except that the proper sequence of continuation courses and the prerequisites must be observed.
Agr. Eng. 3f,s, Mechanical Drawing, 2
Bot. 1f,w,s, General Botany, 4
Bot. 21f,w,s, Elementary Ecology, 3
Bot. 22f,w,s, Elementary Plant Physiology, 3

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For. 1f, General Forestry, 3

For. 3w, Dendrology, 3

For. 4s, Dendrology, 4

Inorg. Chem. 1f-2w-3s, General Inorganic Chemistry, 12. Students presenting a year of high school chemistry may omit this course and register for Inorg. Chem. 9-10. Those required to take this course because of inability to carry successfully Inorg. Chem. 9-10 will be allowed not more than 10 credits.

Inorg. Chem. 9f,w-10w,s, Advanced General Inorganic Chemistry, 10 (1 yr. h. s. chem.). Those required to take Chem. 1-2-3 are exempt.

Math. 3f,w, Higher Algebra, 4. Students presenting higher algebra for entrance may omit this course and substitute 4 credits elective.

Math. 4f,w,s, Trigonometry, 4 (Math 3 or equiv.)

¹Rhet. 1f,w,s, Rhetoric I, 3

Rhet. 2f,w,s, Rhetoric II, 3 (Rhet. 1)

Rhet. 3f,w,s, Rhetoric III, 3 (Rhet. 2)

Itasca Park (Summer Session)

Transfer students who enter the University as juniors may substitute electives for this requirement. All others must complete the Itasca Park work before the beginning of the sophomore year unless given permission on petition to defer it one year. In no case will such students be permitted to register for junior work before completing the summer camp requirement.

Bot. 3su, Forest Botany, 1

Ent. 13su, Field Zoology, 1

For. 2su, Field Dendrology, 1

For. 5su, Field Silviculture, 2

For. 6su, Field Mensuration, 1

SOPHOMORE YEAR

1. *Non-credit courses* required for graduation in addition to the 204 credit hours.

Mil. Sci. 4f-5w-6s, Basic Course. Students found to be physically unfit may be required to substitute special corrective exercises in physical education.

2. *Freshman courses* which were not completed during the freshman year.

3. *General courses*.—The following courses may be registered for any quarter that they are offered except that the proper sequence of continuation courses and the prerequisites must be observed.

Agr. Biochem. 4f,² Introduction to Organic and Biochemistry, 5 (Inorg. Chem. 10 cred.)

Agr. Biochem. 5s,² Plant Biochemistry, 5 (Agr. Biochem. 4, Soils 6)

For. 7f-8w, Forest Mensuration, 10 (For. 6)

Geol. 1f,w,s, General Geology, 5²

Pl. Path. 10f,s, Forest Pathology, 5 (Bot. 10 cred.)

Rhet. 11f,w,s, Argumentation, 3 (Rhet. 3, and 22 recommended) or Rhet. 22f,w,s, Public Speaking, 3 (Rhet. 3) or Rhet. 31f,w,s, Survey of English Literature I, 5 (Rhet. 3) or Rhet. 32f,s, Survey of English Literature II, 3 (Rhet. 3) or Rhet. 33w,s, Contemporary Literature, 3 (Rhet. 3)

Soils 6w, Soils, 5 (Agr. Biochem. 4)

Zool. 14f-15w, General Zoology, 6

JUNIOR YEAR

1. *Sophomore courses* which were not completed during the sophomore year.

2. *General courses*.—The following courses may be registered for any quarter that they are offered, except that the proper sequence of continuation courses and the prerequisites must be observed.

¹ Special attention is called to rules on delayed credit and to regulations for students with insufficient preparation in English on page 80.

² Students electing the commercial lumbering curriculum are exempt from this requirement. Such students should register for Agr. Econ. 1 and Agr. Econ. 2 during their sophomore year.

- Agr. Econ. 1f,w, Principles of Economics I, 3
 Agr. Econ. 2w,s, Principles of Economics II, 5 (Agr. Econ. 1)
 Agr. Eng. 24f-25w, Agricultural Physics, 8 (Math. 4 or equiv.)
 Ent. 6w, Forest Entomology, 4 (Zool. 16 or Ent. 13)
 For. 33f-34w, Wood Structure and Identification, 6 (For. 3-4)
 For. 126f, Silvics, 3
3. *Special courses* selected from one of the major groups (pages 37 to 39) and electives to make from 15 to 18 credit hours per quarter. Full work for the year consists of 51 credit hours.

SENIOR YEAR

1. *Junior courses* which were not completed during the junior year.
2. *General courses.*—The following courses may be registered for any quarter that they are offered, except that the proper sequence of continuation courses and the prerequisites must be observed.
- For. 122f-123w, Forestry Seminar, 2
 For. 134f-135w, Forest Problems, 4 (sr. class.)

A. GENERAL FORESTRY CURRICULUM

Suggested for those who are preparing themselves for technical forest work, such as positions in the federal or state services, or foresters for paper companies, lumber companies, or other large timber owners, involving the growth, management, and harvesting of forest crops. Students majoring in this field are required to spend the spring quarter of the junior year in the field at the Cloquet Forest Experiment Station pursuing the following courses:

- For. 37s, Forest Protection, 3 (For. 127)
 For. 128s, Silviculture Laboratory, 7 (For. 127)
 For. 132s, Forest Regulation Laboratory, 7 (For. 130)

The course of study must also include the following:

- For. 28w, Logging, 3
 For. 127w, Silviculture, 3
 For. 129f, American Silvicultural Practice, 3
 For. 130f, Forest Valuation, 5
 For. 131w, Forest Policy and Administration, 5
 For. 140f, Forest Working Plans, 3
 Agr. Eng. 19f-20s, Surveying, 6

A sufficient number of courses to be selected in consultation with, and with the approval of, the adviser to make a total of 204 credits.

B. COMMERCIAL LUMBERING CURRICULUM

Suggested for those who wish to enter any branch of lumber business. Includes fundamental business courses and a thoro training in the structure, handling, and use of wood. The course of study must include the following courses:

- For. 28w, Logging, 3
 For. 29f, Wood Working Machinery, 3
 For. 30s, Wood Seasoning, 3
 For. 48w, Forest Products, 3
 For. 57f-58w, Uses of Wood I and II, 6
 For. 113f, Wood Pulp and Paper, 3
 For. 114f-115w-116s, Mechanical and Physical Properties of Wood, 9
 For. 125s, Wood Preservation, 3

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Not less than 24 credits (in addition to required courses) in Agricultural Economics and Business Administration.

A sufficient number of courses to be selected in consultation with, and with the approval of, the adviser to make a total of 204 credits.

C. FOREST TECHNOLOGY CURRICULUM

Suggested for those who wish to enter the field of pulp and paper manufacture, wood distillation, wood preservation, etc. Includes a series of courses in chemistry and mathematics and a thoro training in the structure, properties, and uses of wood. The course of study must include the following courses:

- For. 30s, Wood Seasoning, 3
- For. 114f-115w-116s, Mechanical and Physical Properties of Wood, 9
- For. 119w-120s, Advanced Wood Structure, 6
- Math. 5f,w,s, Higher Algebra, 5
- Math. 6f,w,s, Trigonometry, 5
- Math. 7f,w,s, College Algebra, 5
- Math. 30f,w,s, Analytical Geometry, 6
- Math. 50f,w, Calculus I, 5
- Math. 51w,s, Calculus II, 5
- Agr. Biochem. 119f, Colloids, 3
- Agr. Biochem. 121w, Carbohydrates, 3
- Agr. Biochem. 123s, Enzymes, 3
- Phys. 3f,w,s,¹ Elements of Mechanics, 3
- Phys. 4f,w,s,¹ Elements of Mechanics Laboratory, 1
- Phys. 23f,w,¹ Heat, 3
- Phys. 24f,w,¹ Heat Laboratory, 1
- Phys. 43w,s,¹ Electricity, 3
- Phys. 44w,s,¹ Electricity Laboratory, 1

A sufficient number of courses, to be selected in consultation with, and with the approval of, the adviser to make a total of 204 credits.

D. GRAZING CURRICULUM

Suggested for those who wish to prepare themselves for range and management work. It is important that these men should be well prepared in plant physiology, systematic botany, plant ecology, as well as in the underlying principles of forestry. In addition, they should have some knowledge of the feeding and breeding of livestock. The course of study must include the following courses:

- Bot. 7f,s, Elementary Taxonomy, 3
- Agr. Econ. 90f, Agricultural Statistics, 5
- Bot. 113f-114w-115s, Advanced Taxonomy, 9
- Bot. 134s, Research Methods in Ecology, 5
- Bot. 140w, General Plant Physiology, 5
- For. 20w, Grazing, 3
- For. 127w, Silviculture, 3
- For. 130f, Forest Valuation, 5
- For. 131w, Forest Policy and Administration, 5
- Agr. Eng. 19f-20s, Surveying, 6 (Math. 4)

¹ Students who take Phys. 3, 4, 23, 24, 43, and 44 will not be required to complete Agr. Eng. 24w and 25s.

Not less than 9 credits in Animal Husbandry to be selected in consultation with, and with the approval of, the adviser.

A sufficient number of courses, to be selected in consultation with, and with the approval of, the adviser to make a total of 204 credits.

E. GAME MANAGEMENT CURRICULUM

Suggested for those who wish to prepare themselves for a combination of forestry and game management work. It is important that these men be acquainted with the general forestry practices in addition to having a thoro knowledge of biology. Students majoring in game management are required to spend the spring quarter of the junior year in the field at the Cloquet Forest Experiment Station pursuing the following courses:

For. 37s, Forest Protection, 3 (For. 127)

For. 128s, Silviculture Laboratory, 7 (For. 127)

For. 132s, Forest Regulation Laboratory, 7 (For. 130)

The course of study must also include the following courses:

For. 127w, Silviculture, 3

For. 130f, Forest Valuation, 5

For. 140f, Forest Working Plans, 3

Not less than 24-30 credits to be in addition to the required course in Economic Zoology and Zoology, to be selected in consultation with, and with the approval of, the adviser and the chief of the Division of Economic Zoology.

A sufficient number of courses, to be selected in consultation with, and with the approval of the adviser to make a total of 204 credits.

F. FOREST SCIENCES CURRICULUM

Suggested for those who wish to specialize in the various branches of forestry or the forest sciences. It is assumed that students who follow this curriculum will spend one or more years in graduate study. Attention is therefore called to the language requirements for advanced degrees. Only those students who have maintained high scholarship records and who appreciate the true spirit of research should contemplate following this specialization.

The major course of study must include not less than 30 credits in one of the following fields:

Botany	Entomology and Economic Zoology	Plant Pathology
Chemistry	Genetics	Soils
Economics	Geography	

German or French 15 credits. Not less than 15 credits in forestry in addition to required courses.

A sufficient number of courses, to be selected in consultation with, and with the approval of, the adviser and the head of the science department concerned to make a total of 204 credits.

CURRICULA IN HOME ECONOMICS

Specialization in any of the fields of home economics usually involves two types of training for each student. Throughout the training period there is a core of instruction offered for homemaking purposes and, in addition, courses are required depending upon the student's vocational interest and choice. The first two years are essentially the same for all students irrespective of specialization as it is desired that each student shall share in the opportunities which the University offers for orientation and general education. This period includes a study of the physical, biological, and social sciences, English, and art, with opportunities for electives in other fields. The studies to be pursued in the junior and senior years depend largely upon the student's vocational choice. Advisory service is available to all home economics students. Special attention is given to the programs of those persons whose only interest is securing training for homemaking purposes. Reasonable modifications of requirements may be made depending upon the student's special needs and interests subject to the approval of the chief of the Division of Home Economics.

The College of Agriculture, Forestry, and Home Economics and the College of Education co-operate in the preparation of teachers of home economics. At the beginning of the junior year when a student has acquired a minimum of 90 credits and at least one honor point per credit and indicates her specialization as the teachers' or the extension curriculum she becomes also a registrant in the College of Education. The teachers' curricula are arranged in accordance with the provisions of the Smith-Hughes Act.

(For explanation of terms and course numbers, see page 15.)

HOME EXPERIENCE

Clothing.—Home experience in the construction of garments is required of all students who have completed H.E. 11, as a prerequisite to H.E. 13. The character and amount of home experience will be arranged by a member of the faculty of the textile and clothing section.

Foods.—Home experience in cooking following H.E. 83, is a prerequisite for H.E. 35 and H.E. Ed. 49. A conference with a member of the faculty of the foods and cookery section should precede this work. An examination covering this work must be passed. For the schedule of these examinations consult the office of the division.

Placement tests.—Students who have had previous courses in home economics in high school or elsewhere are urged to take placement tests. Those who make sufficiently high scores will be permitted to substitute electives for a part of the required elementary courses in home economics.

GROUP I. GENERAL REQUIREMENTS FOR ALL STUDENTS
IN HOME ECONOMICS

FRESHMAN YEAR

All of the following work is required of every student except for the exemptions indicated. For some students this represents more than the regular amount of work of 15 credit hours per quarter. In such cases those subjects listed below which cannot be taken in the freshman year must take precedence in the following year. Care should be taken in registration to give precedence to courses offered only one quarter.

Not more than one half of the listed credit will be allowed for the courses listed under the freshman and sophomore years, below, unless completed prior to classification as a senior except in the case of students transferring with at least one full year of advanced standing from a college where these courses are not available.

Freshman Assembly. A course of lectures offered only in the fall quarter.

H. E. 3f,w,s,¹ Textiles, 5

H. E. 50f,w,s-51w,s,f, Color and Design, 6

H. E. 70f,w,s, Nutrition Survey, 2

Inorg. Chem. 1f-2w-3s, General Inorganic Chemistry, 12. Students presenting a year of high school chemistry may omit this course and register for Inorg. Chem. 9-10. Those required to take this course because of inability to carry Inorg. Chem. 9-10 successfully will be allowed not more than 10 credits.

Inorg. Chem. 9f,w-10w,s, Advanced General Inorganic Chemistry, 10 (1 yr. h.s. chem.) Those required to take Inorg. Chem. 1-2-3 are exempt from this course.

Ph. s. Ed. 1f-2w-3s, Elementary Physical Training, 3

Rhet. 1f,w,s,² Rhetoric I, 3

Rhet. 2f,w,s, Rhetoric II, 3 (Rhet. 1)

Rhet. 3f,w,s, Rhetoric III, 3 (Rhet. 2)

Sociol. 1f,w,s, Introduction to Sociology, 3

Zool. 17f-18w, General Zoology, 6

SOPHOMORE YEAR

Phys. Ed. 22f, Sophomore Elementary Swimming, 1. Not required of those who can pass the swimming test in their freshman year.

Agr. Biochem. 4f, Introduction to Organic and Biochemistry, 5 (Inorg. Chem. 10 cred.)

Agr. Eng. 23f,s, General Physics, 5. Those presenting a year of high school physics may omit this course and substitute 5 credits elective later in their curriculum.

Bact. 41f,w,s, Elementary Bacteriology, 5 (chem., biol.)

H. E. 15f,w,s, Clothing Problems, 3 (H. E. 3, 50)

H. E. 53f,w,s, Related Art Problems, 3 (H. E. 51 or 56)

H. E. 80f,w,s, Food Preparation, 5 (Agr. Biochem. 4). Not required of those who qualify for H. E. 81.

H. E. 81s, Food Preparation, 3 (Agr. Biochem. 4). Students who have had high school training in foods work and who satisfactorily pass the test for admission to this course may substitute H. E. 81 for H. E. 80.

Psy. 1f,w-2w,s, General Psychology, 6

Rhet. 22f,w,s, Public Speaking, 3 (Rhet. 3)

¹ Transfer students presenting the equivalent of 3 credits in textiles should register for H. E. 102, Advanced Textiles, to complete textiles requirement.

² Special attention is called to rules on delayed credit and to regulations for students with insufficient preparation in English on page 80.

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Electives.—Enough elective credits should be selected to make, with the required work of the freshman and sophomore years, a total of 96 credit hours. The number selected will vary from 1 to 11 credit hours depending upon the specific high school preparation of each student. Those whose programs permit are advised to register for Rhet. 11, Argumentation, 3, otherwise required in the junior year.

JUNIOR YEAR

- General courses.*—The following courses may be registered for any quarter that they are offered except that the proper sequence of continuation courses and prerequisites must be observed.
Agr. Econ. 3f,s, Principles of Economics, 5
H. E. 83f,w,s, Food Management, 3 (H. E. 70, 80 or 81, 85 or parallel)
H. E. 85f,w,s, Food Marketing, 2
H. E. 131f,w,s, Home Management: House Planning and Equipment, 5 (H. E. 53)
Physiol. 4f,w,s, Human Physiology, 4 (Inorg. Chem., 4 cred., Zool., 3 cred.)
H. E. Ed. 40f,w,s, Child Training, 3 (Psy. 1-2)
Prev. Med. 52f,s, Health Care of the Family, 3 (Bact. 41, Physiol. 4)
Rhet. 11f,w,s, Argumentation, 3 (Rhet. 3, 22 advised) or Rhet. 24s, Advanced Public Speaking, 3 (Rhet. 22) or Rhet. 31f,w,s, Survey of English Literature I, 5 (Rhet. 3) or Rhet. 32f,s, Survey of English Literature II, 3 (Rhet. 3) or Rhet. 33w,s, Contemporary Literature, 3 (Rhet. 3)
- Additional courses* as prescribed by the curriculum of the line of specialization selected. See special requirements on pages 42 to 48.
- Electives.*—Enough electives should be selected to make, with those listed in 1 and 2 above, from 15 to 17 credit hours each quarter. Full work for the year consists of 48 credit hours.

SENIOR YEAR

- General courses.*—The following courses may be registered for any quarter that they are offered except that the proper sequence of continuation courses and prerequisites must be observed.
H. E. 34f,w, Home Management: Operation and Maintenance, Lectures, 3 (H. E. 83, H. E. Ed. 40 or parallel)
H. E. 35f,w,s, Home Management: Operation and Maintenance, Laboratory, 6 (H. E. 34 or parallel, 83, H. E. Ed. 40, Prev. Med. 52, home exp. in foods and cookery). Students may be required to substitute other work for this course at the discretion of the division.
H. E. 170f,w,s, Nutrition of the Family, 3 (Agr. Biochem. 4, H. E. 70, 80 or 81, Physiol. 4)
H. E. 171f,w,s, Child Nutrition, 3 (H. E. 170, H. E. Ed. 40)
- Additional courses* are prescribed by the curriculum of the line of specialization selected. See special requirements on pages 42 to 48.
- Electives.*—Enough electives should be selected to make, with those listed above, from 15 to 17 credit hours each quarter. Full work for the year consists of 48 credit hours.

GROUP II. SPECIAL REQUIREMENTS IN THE DIFFERENT LINES OF SPECIALIZATION (SUPPLEMENTARY TO GROUP I)

Students should consult with advisers with reference to the required and elective courses which must be chosen to complete a specialization and to make up the 193 credit hours required for graduation.

In selecting electives, note particularly (a) prerequisites, (b) classes of students (fr., soph., jr., or sr.) to which courses are offered, (c) number of

credits, (d) quarter or quarters offered, and be sure that provision is made in registration for the proper sequence of continuation courses.

Registration for courses as electives in other colleges of the University must be in conformity with the regulations of the college offering the course.

Elective courses in the College of Science, Literature, and the Arts are separated into Lower Division courses (numbered 1 to 49), open to freshmen and sophomores, and Upper Division courses (numbered 50 to 199), open to juniors and seniors. In addition to satisfying other prerequisites a minimum of 90 credits and at least one honor point per credit must be earned before registering for an Upper Division elective.

1. GENERAL CURRICULUM IN HOME ECONOMICS

- a. *General requirements* as listed above, and
- b. *Elective courses* of which the major portion should be chosen from fields other than home economics, e.g., agricultural biochemistry, history, journalism, physics, preventive medicine, sociology, etc.

2. CURRICULUM IN FOODS AND NUTRITION

- a. *General requirements* as listed above with the following additional courses:

Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
 An. Husb. 111w, Utilization of Meats, 3 or
 H. E. 75f,w, Dietetics Laboratory, 2 (H. E. 170 or equivalent or parallel) and
 H. E. 179w,s, Readings in Nutrition, 2 (H. E. 170)
 H. E. 73f,s, Nutrition I, 4 (Agr. Biochem. 4, H. E. 80 or 81, Physiol. 4)
 H. E. 173s, Nutrition in Disease, 3 (H. E. 170, 175)
 H. E. 175f,w, Nutrition II, 4 (H. E. 73)
 H. E. 182f,w,s, Experimental Cookery, 3 (H. E. 80)
 H. E. 186w,s, Special Food Problems, 3 (H. E. 182) or
 H. E. 187w,s, Special Food Problems, 5 (H. E. 182, Agr. Biochem. 2)

- b. *Suggested electives:*

Agr. Biochem. 2, 108, 113, 114, 119, 120, 121, 122, 123; Agr. Eng. 34, 35; Bus. Adm. 79, 88, 89, 130, 167, 168; Eng. 31-32, 33, 73-74; Econ. 1b, 3, 149, 161; German 1-2, 3-4, 24, 25, 26; H. E. 60, 61, 63, 65, 163; Jour. 13, 41, 65, 69; Math. 3, 4, 5, 6, 7; Phys. Chem. 110; Phys. 3, 4, 23, 24, 43, 44; Psy. 3, 56; Rom. Lang., French 1-2, 3-4, 8-9-10.

3. CURRICULUM IN TEXTILES AND CLOTHING

- a. *General requirements* as listed above with the following additional courses:

Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
 H. E. 11f,w,s, Clothing Planning and Construction, A, 3
 H. E. 13f,w,s, Clothing Planning and Construction, B, 3 (H. E. 3, 11, 50, home exp. in garment making)
 H. E. 17w,s, Advanced Clothing, 3 (H. E. 13, 53) or
 H. E. 16f,s, Problems in the Remodeling of Garments and Construction of Children's Clothing, 3 (H. E. 13, 53)
 H. E. 102f,s, Advanced Textiles, 3 (H. E. 3, Agr. Biochem. 3-4, Agr. Econ. 1 or 3 or parallel)
 H. E. 115f,w, Clothing Economics, 2 (H. E. 15 or equiv., Agr. Econ. 1 or 3)

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b. *Elective courses*: One of the following groups must be completed.

Group A

- H. E. 17w,s, Advanced Clothing, 3 (H. E. 13, 53) or
H. E. 18f,s, Commercial Clothing Manufacture, 3 (H. E. 13, 53)
- H. E. 150f,w,s, Art History and Appreciation, 3 (H. E. 51)
- H. E. 154s, Advanced Costume Design, 3 (H. E. 13, 53, 55 recommended)
- Bus. Adm. 69s, Retail Store Management, 3 (Agr. Econ. 1 or 3)
- Psy. 56w, Psychology of Advertising, 3 (Psy. 1-2 and Agr. Econ. 1 or 3)

Group B

- Agr. Biochem. 2f,w, Quantitative Methods, 5 (Inorg. Chem. 10 cred.)
- Bot. 1f,w,s, General Botany, 4
- H. E. 107w, Textile Analysis, 3 (H. E. 102, Agr. Biochem. 2)

c. *Suggested electives*:

Bus. Adm. 79, 167; Econ. 85, 161; H. E. 55; Jour. 13, 41, 65, 69.

4. CURRICULUM FOR DIETITIANS

a. *General requirements* listed above with following additional courses:

- Agr. Biochem. 2f,w, Quantitative Methods, 5 (Inorg. Chem. 10 cred.)
- Agr. Econ. 25f,w, Principles of Accounting, 4
- H. E. 60s, Institution Marketing, 2 (H. E. 61 or parallel, 85)
- H. E. 61f,w,s, Quantity Cookery, 4 (H. E. 80 or 81)
- H. E. 63f,w,s, Institution Experience, 3 (H. E. 80 or 81)
- H. E. 65f,w, Institution Equipment, 2 (H. E. 61, 63, or parallel)
- H. E. 71f, Social Interpretations for Dietitians, 1
- H. E. 73f,s, Nutrition I, 4 (Agr. Biochem. 4, H. E. 80 or 81, Physiol. 4)
- H. E. 75f,w, Dietetics Laboratory, 2 (H. E. 170 or equiv. or parallel)
- H. E. 79s, Selected Problems for Dietitians, 3 (H. E. 170 or equiv.)
- H. E. 163s, Institution Management Problems, 3 (H. E. 61, 63)
- H. E. 173s, Nutrition in Disease, 3 (H. E. 170, 175)
- H. E. 175f,w, Nutrition II, 4 (H. E. 73)
- H. E. 176w, Advanced Nutrition, 4 (H. E. 73, Agr. Biochem. 2) or H. E. 177f,s, Digestion and Metabolism, 3 (H. E. 175, Agr. Biochem. 2)
- H. E. 178f,w,s, Clinical Problems in Nutrition, 2 (H. E. 71 or parallel, 75 or parallel, 170 or parallel, 175)
- H. E. 179f,w,s, Readings in Nutrition, 2 (H. E. 170)
- H. E. 182f,w,s, Experimental Cookery, 3 (H. E. 80)

b. *Suggested electives*: See lists of suggested electives included for curricula in Foods and Nutrition, and in Institution Management.

5. CURRICULUM IN INSTITUTION MANAGEMENT

a. *General requirements* as listed above with the following additional courses:

- Agr. Econ. 25f,w, Principles of Accounting, 4
- Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
- An. Husb. 111w, Utilization of Meats, 3
- Econ. 1bw,s, Business Organization: Marketing, 5
- Econ. 161f,w,s, Labor Problems and Trade Unionism, 3 (Econ. 4 or 6-7)
- H. E. 60s, Institution Marketing, 2 (H. E. 61 or parallel, 85)
- H. E. 61f,w,s, Quantity Cookery, 4 (H. E. 80 or 81)
- H. E. 63f,w,s, Institution Experience, 3 (H. E. 80 or 81)
- H. E. 65f,w, Institution Equipment, 2 (H. E. 61, 63, or parallel)
- H. E. 163s, Institution Management Problems, 3 (H. E. 61, 63)
- H. E. 182f,w,s, Experimental Cookery, 3 (H. E. 80)

b. *Suggested electives:*

Agr. Eng. 34, 35; Bus. Adm. 89, 130, 167, 168; Child Wel. 60; Econ. 3, 149; Eng. 31-32-33, 73-74; H. E. 73 or 75 or 173, 150; Jour. 13, 41, 65, 68; Phys. 3, 4, 23, 24, 43, 44; Psy. 56, 160; Rhet. 28, 32, 33.

CURRICULA FOR TEACHERS

(College of Education)¹

For the junior and senior years the following curricula have been approved by the College of Agriculture, Forestry, and Home Economics and by the College of Education and all students who are candidates for a teacher's certificate are required to pursue one of the following curricula.

Such students become registrants in both colleges during the junior and senior years but register for their freshman and sophomore work in the College of Agriculture, Forestry, and Home Economics. Every student who expects to teach home economics and who expects to obtain the university endorsement for a certificate must sign a specialization card at the beginning of the junior year and meet the following requirements:

6. TEACHERS' CURRICULUM IN GENERAL HOME ECONOMICS

a. *General requirements* listed above with following additional courses:

- Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
 Ed. Psy. 55f,w,s, Educational Psychology, 3 (Psy. 6 cred.) or
 Agr. Ed. 11f,w,s, Educational Psychology, 3
 Hist. Ed. 1f,w,s, Brief Course in the History of Education, 5 (6 cred. in psy.) or
 Hist. Ed. 5s, Public Education in the United States, 3 (6 cred. in psy.) or
 Hist. Ed. 101f, Foundations of Modern Education, 3 (6 cred. in psy. and 6 cred. in hist.) or
 Ed. Ad. 65f, The High School, 3 (Ed. Psy. 55)
 H. E. 11f,w,s, Clothing Planning and Construction, A 3
 H. E. 13f,w,s, Clothing Planning and Construction, B, 3 (H. E. 3, 11, 50, home practice in garment making)
 H. E. 17w,s, Advanced Clothing, 3 (H. E. 13, 53) or
 H. E. 16f,s, Problems in the Remodeling of Garments and Construction of Children's Clothing, 3, (H. E. 13, 53)
 H. E. 150f,w,s, Art History and Appreciation, 3 (H. E. 51)
 H. E. Ed. 42f,w,s, Special Methods and Observation of Teaching Home Economics, 5 (H. E. 13, 83, Psy. 1-2, Agr. Ed. 11 or Ed. Psy. 55)
 H. E. Ed. 49f,w,s, Supervised Teaching of Home Economics, 6 (H. E. Ed. 42)²
 H. E. Ed. 49af,w,s, Observation and Supervised Teaching of Home Economics, 8. (For students who have completed H. E. Ed. 42su.²)
 H. E. Ed. 142af,w, Educational Measurement in Home Economics, 2 (H. E. Ed. 42)
 H. E. Ed. 143w,s, Home Economics Curricula, 2 (H. E. Ed. 42 or parallel)

b. *Elective courses:* Ten credits must be elected from Group A

Group A

Anthropol. 41, 114; Child Wel. 60, 80, 90, 120, 130, 170; Eng. 31-32, 33, 73-74; French 1-2, 3-4; Geog. 11, 41; German 1-2, 3-4; Hist. 1-2, 7-8-9; Jour. 13, 14-15, 41, 65, 69, 73-74, 82; Phil. 1, 3, 10; Pol. Sci. 1-2, 25; Rhet. 28, 29, 32, 33, 34; Soc. 14, 55, 93, 110, 114, 119, 120.

¹ See scholarship requirements for admission to the College of Education, page 13.

² In addition to other prerequisites students registering for this course must have received a grade of C or higher in each of the following courses: H. E. 3, 11, 13, 50, 51, 53, 80 or 81, and 83, and must have passed a qualifying examination.

c. *Suggested electives:*

Agr. Econ 25; Agr. Eng. 34, 35; Art Ed. 7, 8, 9; Astron. 11; Bot. 1; Ed. Psy. 60; Fine Arts 1, 2, 3, 5; Geol. 8; H. E. 55, 57, 61, 73, 75, 102, 136, 152, 154, 173, 175, 179, 182, 186, 195; H. E. Ed. 147; Music 1-2-3, 7-8-9, 40-41-42, 43-44-45; Psy. 3, 56; Zool. 183.

7. TEACHERS' CURRICULUM IN HOME ECONOMICS EXTENSION

a. *General requirements* as listed above with the following additional courses:

Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
 Ed. Psy. 55f,w,s, Educational Psychology, 3 (Psy. 6 cred.) or
 Agr. Ed. 11f,w,s, Educational Psychology, 3
 Agr. Ed. 11fw,s, Educational Psychology, 3
 Hist. Ed. 1f,w,s, Brief Course in the History of Education, 5 (6 cred. in psy.) or
 Hist. Ed. 5s, Public Education in the United States, 3 (6 cred. in psy.) or
 Hist. Ed. 101f, Foundations of Modern Education, 3 (6 cred. in psy. and 6 cred. in hist.) or
 Ed. Ad. 65f, The High School, 3 (Ed. Psy. 55)
 H. E. 11f,w,s, Clothing Planning and Construction, A, 3
 H. E. 13f,w,s, Clothing Planning and Construction, B, 3 (H. E. 3, 11, 50, home practice in garment making)
 H. E. 17w,s, Advanced Clothing, 3 (H. E. 13, 53) or
 H. E. 16f,s, Problems in the Remodeling of Garments and Construction of Children's Clothing, 3 (H. E. 13, 53)
 H. E. 44w, Home Economics Extension Work, 3 (H. E. Ed. 42, 49 or parallel)
 H. E. 150f,w,s, Art History and Appreciation, 3 (H. E. 51)
 H. E. Ed. 42f,w,s, Special Methods and Observation of Teaching Home Economics, 5 (H. E. 13, 83, Psy. 1-2, Agr. Ed. 11 or Ed. Psy. 55)
 H. E. Ed. 49f,w,s, Supervised Teaching of Home Economics, 6 (H. E. Ed. 42¹)
 H. E. Ed. 49af,w,s, Observation and Supervised Teaching of Home Economics, 8 (For students who have completed H. E. Ed. 42su¹)
 H. E. Ed. 142af,w, Educational Measurements in Home Economics, 2 (H. E. Ed. 42)
 H. E. Ed. 143w,s, Home Economics Curricula, 2 (H. E. Ed. 42 or parallel)

b. *Elective courses and suggested electives:* See lists included in Teachers' Curriculum in General Home Economics.

8. TEACHERS' CURRICULUM IN FOODS AND NUTRITION

a. *General requirements* as listed above with the following additional courses:

Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
 Ed. Psy. 55f,w,s, Educational Psychology, 3 (Psy. 6 cred.) or
 Agr. Ed. 11f,w,s, Educational Psychology, 3
 Hist. Ed. 1f,w,s, Brief Course in the History of Education, 5 (6 cred. in psy.) or
 Hist. Ed. 5s, Public Education in the United States, 3 (6 cred. in psy.) or
 Hist. Ed. 101f, Foundations of Modern Education, 3 (6 cred. in psy. and 6 cred. in hist.) or
 Ed. Ad. 65f, The High School, 3 (Ed. Psy. 55)
 H. E. 73f,s, Nutrition I, 4 (Agr. Biochem. 4, Physiol. 4)

¹ In addition to other prerequisites students registering for this course must have received a grade of C or higher in each of the following courses: H. E. 3, 11, 13, 50, 51, 53, 80 or 81, and 83, and must have passed a qualifying examination.

- H. E. 173s, Nutrition in Disease, 3 (H. E. 170, 175) or
 H. E. 175f,w, Nutrition II, 4 (H. E. 73) or
 H. E. 75f,w, Dietetics Laboratory, 2 (H. E. 170 or equivalent or parallel) and
 H. E. 179f,w,s, Readings in Nutrition, 2 (H. E. 170)
- H. E. 182f,w,s, Experimental Cookery, 3 (H. E. 80)
- H. E. 186w,s, Special Food Problems, 3 (H. E. 182) or
 H. E. 187w,s, Special Food Problems, 5 (H. E. 182, Agr. Biochem. 2)
- H. E. Ed. 42f,w,s, Special Methods and Observation of Teaching Home Economics, 5
 (H. E. 13, 83, Psy. 1-2, Agr. Ed. 11 or Ed. Psy. 55)
- H. E. Ed. 49f,w,s, Supervised Teaching of Home Economics, 6 (H. E. Ed. 42¹)
- H. E. Ed. 49af,w,s, Observation and Supervised Teaching of Home Economics, 8
 (For students who have completed H. E. Ed. 42su¹)
- H. E. Ed. 142af,w, Educational Measurements in Home Economics, 2 (H. E. Ed. 42,
 Ed. Psy. 55 or Agr. Ed. 11)
- H. E. Ed. 143w,s, Home Economics Curricula, 2 (H. E. Ed. 42 or parallel)

b. *Elective courses.*—Thirteen additional credits from the following courses must be completed:

- Agr. Biochem. 2, 108; Agr. Eng. 34, 35; Anthropol. 41, 114; Child Wel. 60, 80, 90,
 120, 130, 170; Eng. 31-32, 33, 73-74; Geog. 11, 41; German 1-2, 3-4, 24-25-26;
 Hist. 1-2; H.E. 11, 13, 16, 17, 60, 61, 63, 65, 136, 150, 163; Jour. 13, 41, 65,
 69; Pol. Sci. 1-2, 25; Rhet. 28, 29, 32, 33, 34; Rom. Lang., French 1-2, 3-4, 8-9-10;
 Soc. 14, 55, 93, 104, 110, 119, 120

See also lists of suggested electives for curriculum for Foods and Nutrition, and for Teachers' Curriculum in General Home Economics.

9. TEACHERS' CURRICULUM IN TEXTILES AND CLOTHING

a. *General requirements* as listed above with the following additional courses:

- Agr. Econ. 126f,s, Economics of Consumption, 3 (Agr. Econ. 1 or 3)
- Ed. Psy. 55f,w,s, Educational Psychology, 3 (Psy. 6 cred.) or
 Agr. Ed. 11f,w,s, Educational Psychology, 3
- Hist. Ed. 1f,w,s, Brief Course in the History of Education, 5 (6 cred in psy.) or
 Hist. Ed. 5s, Public Education in the United States, 3 (6 cred. in psy.) or
 Hist. Ed. 101f, Foundations of Modern Education, 3 (6 cred. in psy. and 6 cred.
 in hist.) or
 Ed. Ad. 65f, The High School, 3 (Ed. Psy. 55)
- H. E. 11f,w,s, Clothing Planning and Construction, A, 3
- H. E. 13f,w,s, Clothing Planning and Construction, B, 3 (H. E. 3, 11, 50, home ex-
 perience in garment making)
- H. E. 17w,s, Advanced Clothing, 3 (H. E. 13, 53) or
 H. E. 16f,s, Problems in the Remodeling of Garments and Construction of Chil-
 dren's Clothing, 3 (prereq., 13, 53)
- H. E. 102f,s, Advanced Textiles, 3 (H. E. 3, Agr. Biochem. 4, Agr. Econ. 1 or 3 or
 parallel)
- H. E. 115f,w, Clothing Economics, 2 (H. E. 15 or equiv., Agr. Econ. 1 or 3)
- H. E. 150f,w,s, Art History and Appreciation, 3 (H. E. 51)
- H. E. Ed. 42f,w,s, Special Methods and Observation of Teaching Home Economics, 5
 (H. E. 13, 83, Psy. 1-2, Agr. Ed. 11 or Ed. Psy. 55)
- H. E. Ed. 49f,w,s, Supervised Teaching of Home Economics, 6 (H. E. Ed. 42¹)
- H. E. Ed. 49af,w,s, Observation and Supervised Teaching of Home Economics, 8 (For
 those who have completed H. E. Ed. 42su¹)

¹In addition to other prerequisites students registering for this course must have received a grade of C or higher in each of the following courses: H. E. 3, 11, 13, 50, 51, 53, 80 or 81, and 83, and must have passed a qualifying examination.

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H. E. Ed. 142af,w, Educational Measurements in Home Economics, 2 (H. E. Ed. 42, Ed. Psy. 55 or Agr. Ed. 11)

H. E. Ed. 143w,s, Home Economics Curricula, 2 (H. E. Ed. 42 or parallel)

b. *Elective courses.*—Nine additional credits from the following courses must be completed:

Agr. Biochem. 2; Botany 1; H. E. 16 or 17, 55, 57, 107, 154, 195.

10. TEACHERS' CURRICULUM IN RELATED ART

a. *General requirements* as listed above with the following additional courses:

Art Ed. 4f-5w-6s, Still Life, 3

Art Ed. 7f-8w-9s, Sketch, 3

Art Ed. 29f-30w-31s, Sketch, Course II, 3 (Art Ed. 7-8-9)

Ed. Psy. 55f,w,s, Educational Psychology, 3 (Psy. 6 cred.) or

Agr. Ed. 11f,w,s, Educational Psychology, 3

Hist. Ed. 1f,w,s, Brief Course in the History of Education, 5 (6 cred. in psy.) or

Hist. Ed. 5s, Public Education in the United States, 3 (6 cred. in psy.) or

Hist. Ed. 101f, Foundations of Modern Education, 3 (6 cred. in psy. and 6 cred. in hist.) or

Ed. Ad. 65f, The High School, 3 (Ed. Psy. 55)

H. E. 11f,w,s, Clothing Planning and Construction, A, 3

H. E. 13f,w,s, Clothing Planning and Construction, B, 3 (H. E. 3, 11, 50, home experience in garment making)

H. E. 55f, Decorative Needlework and Other Crafts, 3 (H. E. 53 or parallel)

H. E. 57s, Batik and Other Crafts, 3 (H. E. 3, 53 or parallel)

H. E. 150f,w,s, Art History and Appreciation, 3 (H. E. 51)

H. E. 152w, Advanced Interior Design, 3 (H. E. 53, 131 or parallel, 150)

H. E. 154s, Advanced Costume Design, 3 (H. E. 13, 53, 55 recommended)

H. E. Ed. 42f,w,s, Special Methods and Observation of Teaching Home Economics, 5 (H. E. 13, 83, Psy. 1-2, Agr. Ed. 11 or Ed. Psy. 55)

H. E. Ed. 49f,w,s, Supervised Teaching of Home Economics, 6 (H. E. Ed. 42¹)

H. E. 49af,w,s, Observation and Supervised Teaching of Home Economics, 8 (For those who have completed H. E. Ed. 42su¹)

H. E. Ed. 147w, Organization and Methods for Related Art Teaching, 3 (H. E. Ed. 42 or parallel, H. E. 53, 131 or parallel)

b. *Elective courses.*

11. RESEARCH IN THE FIELD OF HOME ECONOMICS

In the undergraduate curricula there is not sufficient opportunity to prepare prospective research workers adequately except in so far as electives may be used in that direction, with the expectation of continuing with graduate study after graduation. Persons interested in research in textiles, nutrition, home management, home economics education, related art, home equipment, etc., should choose all electives following consultation with a faculty member interested in that particular field.

¹ In addition to other prerequisites a student registering for this course must have received a grade of C or higher in each of the following courses: H. E. 3, 11, 13, 50, 51, 53, 80 or 81, and 83, and must have passed a qualifying examination.

DESCRIPTION OF COURSES

AGRICULTURAL BIOCHEMISTRY

This division offers two types of work, namely, courses in those phases of chemistry which have special application in agriculture or home economics for students whose major work is in other divisions; and courses designed to train chemists for research or instruction in the special field of agricultural biochemistry.

2. Quantitative Methods. Principles of quantitative analysis, including stoichiometric problems, practice in the use of the balance and in typical gravimetric and volumetric manipulations.
4. Introduction to Organic and Biochemistry. An introduction to the chemistry of carbon compounds directed toward an understanding of the principles underlying the classification, structure, and general properties of those which are of biological importance.
5. Plant Biochemistry. An introduction to the chemistry, metabolism, and nutrition of plants based on the organic and inorganic compounds which are characteristic of plants and plant products, and their reactions and interactions.
6. Animal Biochemistry. An introduction to the chemistry, metabolism, and nutrition of animals based on the organic and inorganic compounds which are characteristic of animals and animal products and their reactions and interactions.
- 101-102. Agricultural Quantitative Analysis. The estimation of inorganic and organic constituents of biological products, the proximate analysis of foods and feeding stuffs, the use of the polariscope, immersion refractometer, colorimeter and nephelometer, viscosimeter, and other special apparatus.
103. Dairy Chemistry. Lectures and laboratory work on the physical, colloidal, and chemical properties of milk and dairy products, the chemistry of the various constituents of milk and of the processes involved by the manufacture of dairy products.
108. Chemistry of Wheat and Wheat Products. A lecture course, with collateral library reference work, on the chemical technology of the production and milling of wheat and the conversion of its products into human food.
110. Flour Laboratory Methods. A laboratory course in methods of analysis of wheat and its products; milling tests of wheat, baking, and special tests of flour. Designed to train students for research and control work in the cereal industry.
- 113-114-115. Biochemical Laboratory Methods. A laboratory course paralleling the lectures in 119-123, using recent methods for the investigation of biologically important compounds.
116. Advanced Animal Nutrition. Recent developments in animal nutrition, covering the field of proteins, mineral metabolism, and vitamins.

117. Laboratory Problems in Animal Nutrition. A laboratory course on methods used in nutrition studies.
118. Laboratory Problems in Biochemistry. Special laboratory work in the preparation and isolation of pure compounds which occur in living cells, the study of biochemical reactions, and special methods of identification or determination of biochemical products.
119. Colloids. Lectures and assigned readings dealing with the colloidal state of matter, the preparation and properties of colloidal systems, and the relation of these to biochemical processes.
120. Proteins. Lectures and assigned readings on composition, structure, chemical and physical properties, and the functions of proteins and amino acids.
121. Carbohydrates. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the carbohydrates.
122. The Lipids and Fats. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the fats and fatlike compounds.
123. Enzymes. Lectures and assigned readings on enzyme action, including the methods of preparation and investigation of enzymes and their function in biological and industrial processes.

AGRICULTURAL ECONOMICS

1. Principles of Economics I. For students in Agriculture and Forestry.
2. Principles of Economics II. For students in Agriculture and Forestry.
3. Principles of Economics. For students in Home Economics.
7. Natural Resources. A study of the natural resources of the United States and other countries in their relation to agriculture. Attention is given to the importance of these resources and to their wise utilization. Lectures, reference work, and discussions.
8. Rural Economics. An economic analysis of a number of the important social problems of agriculture, including organization of the agricultural industry, tenancy, farm incomes, rural population and standards of living, tariff, taxation, and agricultural policy.
25. Principles of Accounting.
30. Agricultural Prices. Factors determining price measurement and trend in prices of agricultural commodities. Adjustment of production to price changes. Foreign competition. Price stabilization. Price policies.
40. Principles of Marketing Organization. The principles of the organization of the market and of marketing enterprises, both proprietary and co-operative.
47. Marketing Accounting.
50. Farm Finance. The mechanism of exchange with special reference to the financing of the production and marketing of farm products.
90. Agricultural Statistics. Statistical method applied to the analysis of agricultural data; collection, tabulation, and graphical presentation; averages; measures of dispersion; index numbers; time series.

101. Farm Management. Farm records—simple farm accounting and the forms and methods employed in making cost of production studies and farm management surveys. Practice in record keeping and accounting.
102. Farm Organization. The business side of farming is emphasized. Attention is given to principles underlying farm organization and factors affecting returns. Analysis of farm business statements.
103. Farm Operation. Selection and adjustment of crop and livestock enterprises. Utilization of labor, power, and equipment. Physical and productive reorganization of the farm business. Problems encountered by farmers in the operation of their business.
104. Types of Farming. A study of types of farming and of prevailing farm practices in the principal agricultural production areas.
- 110-111. Economics of Agricultural Production. The principles of production economics applied to agriculture, special emphasis being placed upon profitable combinations of factors of production, comparative advantage and localization of production.
126. Economics of Consumption. Nature of human wants; standards of living; costs of living; income, administration of income; nature of demand; demand and price; relation of consumption to the population problem.
131. Market Prices. Manner in which prices are determined in the market place. Local, wholesale, and retail prices. Price fluctuation and speculation. Prices and market grades. Market quotations.
135. Methods of Price Analysis. Statistical methods for the study of the forces determining prices, forecasting price changes, and determining "established prices." Survey of research work in the field.
140. Marketing Organization: Staples. Principles of production economics applied to the organization of markets and marketing organization for the grains, tobacco, cotton, and wool. Special attention to grain marketing.
141. Marketing Organization: Dairy and Poultry Products.
142. Marketing Organization: Fruits and Vegetables.
143. Marketing Organization: Livestock and Meats.
144. Co-operative Organization. Development of co-operation in agriculture in the United States and foreign countries. Analysis of economic problems peculiar to co-operative organization, especially of marketing agencies.
150. Advanced Farm Finance. A consideration of credit problems of farmers with special attention to institutions financing farmers.
170. Land Economics. Land as a factor of production; rural and urban utilization; rents and land values; land classification; land exchange.
191. Advanced Agricultural Statistics. Analysis of agricultural data by methods of correlation, partial and multiple correlation.

See also courses in Economics and Business Administration.

AGRICULTURAL EDUCATION

COLLEGE OF EDUCATION

11. Educational Psychology. The main facts and principles of educational psychology and the fundamental principles upon which education is based. Emphasis is placed on those phases which are most closely related to vocational education.
21. Vocational Education. A short history of vocational education; present status in Europe and the United States; manual training and home arts in an educational system; place of agriculture in the public schools with special reference to Minnesota.
- 41.¹ Apprentice Teaching. An introductory course in teaching, including observation of class work, apprentice teaching, and special conference discussions of problems relating to teaching. Intended to initiate the student into the routine of classroom procedure. Professional readings. (Not offered in 1932-33.)
- 42.¹ Supervised Teaching Experience. Preparation of lesson plans and actual teaching of classes under careful supervision in recitation and laboratory; criticism and discussion of plans, methods, and results of student teaching. Review and discussion of assigned professional readings.
64. Survey of Agriculture. A course in general agriculture designed to give students practical familiarity with fundamental principles and basic facts, best procedures, literature, and important problems of agriculture in this region.
75. Visual Presentation. To prepare persons for presenting materials by means of slides, films, charts, etc. Students assist in assembling materials for their own use and in acquiring skill and technique in preparation and operation of various mediums.
81. Extension Work. Federal, state, and local extension aims, organization. Assembling and use of extension data and equipment. Development of extension methods especially as applied to the work of Minnesota.
82. Agricultural Extension Field Course. Actual field practice in extension work on part salary in addition to credits. Number admitted to course limited by positions available. Usually will cover summer quarter, may extend into fall quarter.
135. The Curriculum in Vocational Agriculture. A study of curriculum organization, determination of subject-matter, organization of subject-matter, job analysis, course construction, texts, and references.
141. Supervised Practice in Vocational Agriculture. A special methods course dealing with the selection, planning, supervising, and summarizing of the practical work in agriculture. Special emphasis on the problem method of teaching, and the use of the farm and community for teaching purposes.
144. Course Organization and Instruction for the Individual in Vocational Agriculture. Subject-matter content for the individual should be based

¹ A special fee of \$1 per credit hour is charged for this course.

- on farm activities. Individuals should progress according to abilities and needs. Accepting these principles, this course includes selection and organization of content, administration, and teaching technique.
154. Rural Education and Community Leadership. The school as a community center, and organizing educational, social, and recreational activities, clubs, festivals, fairs, and other desirable features of rural community life, such as future farmers of America.
 161. Vocational Education in Agriculture. A study of the principles developed and established in agricultural education. The principles developed in other vocational education and their relation to agricultural education.
 162. The Basis of Vocational Teaching Technique. A course which includes an analysis of the philosophical, psychological, and other bases of teaching technique from the viewpoint of the teacher of vocational agriculture.
 164. Fundamentals of Agriculture. Emphasis on current problems in meats, milk, poultry, plant pathology, mechanical training, and other essentials for teachers of agriculture.
 171. Problems in Procedure. For agriculture teachers. Emphasizes working out problems in detail in order that the processes as formulated can be used in teaching the following year by those enrolled. Discussions, readings, papers, laboratory.
 176. Problems in Visual Presentation. Special attention to use of visual aids in teaching agriculture. The development of proper visual methods by means of research.
 181. Teaching Agriculture. Special methods course dealing with conducting a high school agriculture department. Observations of class work, apprentice teaching, curriculum organization, supervised farm practice, and use of the farm and community for teaching purposes.
 182. Teaching Agriculture. Special methods course dealing with conducting a high school agriculture department. Fundamentals of method in teaching as related to teaching agriculture in high school. Organizing subject-matter. Selection and manipulation of devices.
 183. Teaching Agriculture. Organization and administration of agriculture in secondary schools including all day, part time, and evening school instruction. Special emphasis on equipment, text and reference books, extension work, and organizations.
 - 191-192-193. Seminar in Agricultural Education. Critical studies of important problems in agricultural education; opportunity for individual investigation and research; review and interpretation of current educational literature.

AGRICULTURAL ENGINEERING

3. Mechanical Drawing. Materials, instruments, and their uses. Lettering, scale reading, conventional symbols, and blue printing. Orthographic projection, pictorial drawing, and planning farm buildings (Agriculture); or records and plots of surveys, contour and profile map tracing (Forestry).

5. Farm Building Design and Construction. Instruction and practice in design of details and in construction of farm buildings.
7. Farm Structures I. The arrangement, planning, and designing of farm buildings with special attention to their convenience, economy, and durability.
11. Applied Mathematics. Rules of practical mathematics with special attention to formulas and problems directly related to agricultural and forestry work; e.g., areas, volumes, progressions, statistics, averages, proportions, variations, investments, cost problems.
12. Field Machinery. Construction, operation, adjustment, and use of soil preparation, seeding and harvesting machinery.
13. Gas Engines. Theory, operation, care, and repair of gasoline engines.
14. Tractors. Lecture and laboratory course dealing with the construction, operation, care, adjustment, testing, and use of the tractor.
15. Ignition and Carburetion. Lecture and shop study of the construction and action of the various forms of ignition and carburetion systems in use on gas engines of all types.
19. Elementary Surveying. Use of tape, level, transit, and traverse board in agricultural field problems, e.g., mensuration surveys, traverses, differential and profile leveling; plotting and mapping. Care and adjustment of instruments.
20. Advanced Surveying. Topographic surveys by stadia and other methods, running simple curves, cross sectioning, plotting the survey, profile building, grade determination, and figuring of quantities in earth work.
23. General Physics. The elements of physics for those who have not had physics in high school. Mechanics, heat, light, and electricity with laboratory work.
24. Agricultural Physics I. An applied course involving lectures and laboratory work in mechanics and heat.
25. Agricultural Physics II. A practical lecture, recitation, and laboratory course on electricity and light, including electric generating plants, batteries, motors, lighting systems, and light and radiant energy as applied to farm problems.
28. Land Clearing. Land clearing methods, machinery, and care and use of explosives.
31. Principles of Drainage. Elementary principles and practice of soil erosion control and of drainage in relation to plant growth, crop and land values, and farm operation and development.
34. Household Mechanics. Lectures and recitations on household appliances and methods of operation, such as water supply, plumbing, sewage disposal, washing, cooking, refrigeration, heating, and electrical appliances.
35. Household Physics. A course of lectures and laboratory work on the principles of physics that apply to cooking, cleaning, plant and animal growth, dyeing, and other subjects of household importance. Molecular physics, heat, light, and color.

37. Rural Sanitation. Wells, pumps, and water supply. Methods of securing sanitary water systems for farmsteads and rural institutions. Sanitary sewage disposal methods for homes, creameries, etc.
40. Mechanical Training I. Instruction and laboratory practice in mechanical trades embracing rope work, belt lacing and pulleys, cement work, soldering, electric wiring, harness repair, etc.
41. Mechanical Training II. Instruction and laboratory practice in mechanical trades embracing metal work, tool sharpening, painting, wood finishing, machinery repairs. Special attention given to practical applications and features of special interest to teachers.
42. Principles of Irrigation. Irrigation and the development of arid and semi-arid lands, irrigation practices; duty of water and water rights; correlation of drainage and irrigation.
43. Mechanical Laboratory. Instruction and laboratory practice in mechanical work embracing rope work, belt lacing and pulleys, cement work, soldering, welding, pipe fitting, electric wiring, etc. Open to professional agricultural engineering students only.
67. Farm Structures II. Planning, estimating, and construction of farm buildings. Study of materials commonly used.
68. Drainage Engineering and Works. Design, location, and construction of public and private drainage systems and works; construction estimates, drainage engineering, and public records.
69. Irrigation Engineering and Works. Design, location, and construction of irrigation works; reservoir and transmission losses; general irrigation law; irrigation engineering and public records.
70. Steam Boilers and Engines. Construction, operation, and care of simple steam engines and boilers.
71. Power Machinery. Study of machines requiring mechanical power for their operation, such as feed grinders, corn shredders, ensilage cutters, threshers.
72. Applied Electricity. Laboratory work in direct and alternating current machines as used on farms, including generators, motors, storage batteries, transformers, and complete isolated electric and hydroelectric plants.
- 91-99. Agendum. General agricultural engineering seminar. Official conference of entire group. Topics of broad general interest to agricultural engineers discussed; as, for example, research problems, government service, agricultural engineering functions and development.
- 101-102-103. Advanced Drainage Problems. Special drainage problems including surface run-off, soil permeability, relation of soil and crop type to drainage, shape and regulation of water table in relation to root growth, etc.
- 111-112-113. Farm Building Problems. Investigations in the utility and durability of building materials. Methods of construction, costs, and efficiency of farm buildings.

- 121-122-123. Farm Power and Machinery Problems. Special studies of farm machinery and mechanical power for the farm. Tests, design, and adaptability to various farm conditions.
126. Selection of Farm Equipment. Types, sizes, and quantity of power and machine units for various types of farming.
141. Land Clearing II. Special problems in stump removal under different conditions of soil and vegetation; stone removal; dirt blasting in construction of silos, temporary ditches, and building excavations. Breaking virgin soils of varying composition and texture. Technique in use and manufacture of explosives and design of land clearing equipment.
150. Seminar. Students will give reports of their investigations on certain assigned problems for research.

AGRONOMY, FARM MANAGEMENT, AND PLANT GENETICS

1. General Farm Crops. A study of the important field crops of the United States.
121. Grain Crops. Structure, function, culture, improvement, and uses of corn, wheat, oats, barley, rye, flax, and buckwheat.
122. Grain and Hay Grading. Development of grades, study of grading methods, and actual practice in grading grain and hay samples according to federal standards. Training in judging grain and hay on quality basis.
123. Forage Crops. A study of the structure, function, culture, and improvements and uses of forage crops including meadow and pasture management.
124. Problems in Farm Crops. Through the use of the problem method, the student is given opportunity to deal with important phases of agronomy.
126. Advanced Crop Judging. Identification of crops, weeds, and diseases in relation to judging and grading farm crops.
131. Principles of Genetics. Fundamental principles of breeding, heredity, variation, biometry, and evolution.
132. Farm Crops Plant Breeding. Applied genetics. Methods of breeding each of the important agricultural crops.
134. Laboratory Problems in Genetics. Sex linkage, dominance, effects of lethal factors, independent inheritance, and factor linkage studied in appropriate crosses, using *Drosophila melanogaster*.

ANALYTICAL CHEMISTRY

SCHOOL OF CHEMISTRY

1-2. Analytical Chemistry.

For additional courses and course descriptions see the bulletin of the School of Chemistry.

ANIMAL HUSBANDRY

- 1-2. Types and Market Classes of Livestock. Livestock markets, and marketing methods. The market classes of horses, cattle, sheep, and swine. Practice in classifying, judging, and appraising livestock.

- 3-4. Types and Breeds of Livestock. The types as related to performance and production in horses, beef cattle, sheep, and swine, and the origin, history, characteristics, and economic importance of the breeds, classified according to type.
5. Livestock Judging. Practice in judging horses, cattle, sheep, and hogs from both the market and breed standpoint.
6. Livestock Feeding. Feeding livestock under farm conditions; efficiency and economy in feeding, growing, and fattening meat animals; feeding draft horses and colts. Consideration of experimental work and present practice. Practical feeding problems.
7. Meats. Dressing of animals and the cutting of carcasses. Lectures and laboratory work.
8. Fundamentals of Feeding and Management. A study of livestock and dairy feeding designed for students not majoring in animal industry. Not open to those who have completed Course 6 or Dy. Husb. 103.
12. Meat Selection and Utilization. Lectures on the characteristics and peculiarities of meat as secured from different food animals. A comparative study of carcass value and utilization of parts. Score card and meat judging practice.
15. Fundamentals of Livestock Production. Basic principles involved in the breeding, feeding, and management of livestock.
101. Advanced Stock Judging. Competitive judging of all types, breeds, and classes of livestock supplemented by visits to nearby stock farms.
106. Advanced Meats. Practice work in dressing animals and cutting carcasses, giving particular attention to conformation as related to dressing percentage and the carcass; a study of the physical and chemical composition of meat.
107. Meat Problems. The wholesale cuts and grades of meat; the packing industry and the utilization of by-products. Special problems and trips to packing establishments.
- 108, 109, 110. Seminar. Special problems and research assignments on investigations pertaining to the livestock industry.
111. The Utilization of Meats. A detailed study of the different cuts of pork, beef, veal, mutton, and lamb, with reference to prices, relative economy, uses, nutritive value, chemical composition, ripening, curing, palatability. (For Home Economics students.)
112. Animal Breeding. The application of the principles of genetics to the breeding of livestock; a review of the master-breeders' methods and consideration of the practical breeders' problems.
113. Livestock Management. Management problems in market stock and in purebred livestock production. A study of the essential management principles involved in each of the several types of specialization in livestock production. A general course covering horses, beef cattle, sheep, and hogs.
114. Advanced Study of the Breeds of Livestock. A study of the history and blood lines in the leading breeds of livestock.

115. The Marketing of Livestock. A study of the methods used in the principal livestock markets; visits to the South St. Paul market; selling purebred livestock.
116. Embryology of Farm Animals. A study of the differentiation and development of organs, tissues, and body parts of farm animals with special reference to the pig.

ANTHROPOLOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

41. Introduction to Anthropology.
54. Cultural Anthropology.
62. Ethnology.
80. The American Indian.
110. Physical Anthropology.
112. The American Negro.
113. The Peoples of Europe.
114. The American People.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

ARCHITECTURE

COLLEGE OF ENGINEERING AND ARCHITECTURE

- 21-22-23. Elementary Freehand Drawing.

For additional courses and course descriptions see bulletin of the College of Engineering and Architecture.

ART EDUCATION

COLLEGE OF EDUCATION

- 1-2-3. Fundamental Principles of Design.
- 4-5-6. Still Life.
- 7-8-9. Sketch.
- 10-11-12. Composition.
- 20-21-22. Principles of Harmony in Form and Color.
- 29, 30, 31. Sketch, Course II.

For additional courses and course descriptions see the bulletin of the College of Education.

BACTERIOLOGY AND IMMUNOLOGY

MEDICAL SCHOOL

- 41.¹ General Bacteriology.
103. Soil Microbiology. Studies of the microscopic inhabitants of the soil, their interrelationships and rôle in the transformations of soil constituents with particular emphasis on the cycles of carbon, nitrogen, and sulphur in nature.

¹ A fee of \$1.50 is charged for this course.

105. Food Bacteriology. The decay, fermentation, and putrefaction of foods; molds; canning; bacterial food poisoning.

For additional courses and course descriptions see the bulletin of the Medical School.

BOTANY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

1. General Botany.
2. Elementary General Morphology of Plants.
3. Forest Botany. Field work in the classification and recognition of the herbaceous and shrubby undergrowth of the different forest types, together with quadrat and statistical studies.
5. Elementary Plant Histology.
7. Taxonomy of Flowering Plants.
12. Morphology of Algae.
13. General Morphology of Fungi.
21. Elementary Ecology.
22. Elementary Plant Physiology.
51. Histological Methods.
63. Gymnosperms and Angiosperms.
101. Elementary Biometry.
- 113-114-115. Advanced Taxonomy.
118. Cytology.
127. Anatomy of Vascular Plants.
131. Field Ecology.
132. Ecological Anatomy.
133. Plant Geography of North America.
134. Research Methods in Ecology.
141. Physico-chemical Principles in Plant Physiology.
142. Photosynthesis.
143. Plant Metabolism and Growth.
144. Plant Microchemistry.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

CHILD WELFARE INSTITUTE

40. Child Training. A study of the physical and mental development of the child followed by a discussion of the problems of training young children. Observations in the Nursery School, lectures, and reports.
60. Modern Aspects of Child Study. A survey of the background and present scope of modern child study in its various aspects, such as nursery schools and parental education, child health and mental hygiene, the kindergarten and Montessori movements, and the development of research organizations.
80. Child Psychology. A survey of child development with special reference to nursery school and kindergarten education.

90. Physical Development of the Young Child. The physical growth and development of the young child in its anatomical, physiological, and functional aspects.
120. Health Care of the Young Child. A course in the physical care, illnesses, prevention of disease, and health problems of the young child. Primarily for those who have charge of groups of children, and for workers in parental education. Opportunities for observation in the Nursery School and in clinics. In co-operation with the Department of Pediatrics.
130. The Development of the Young Child. An advanced course dealing with the development of the pre-school child from the anatomical, physiological, psychological, educational, and social aspects. Lectures, readings in the experimental literature, and reports.
- 133-134-135. Methods in the Study of Development of Young Children. A study of various methods and techniques such as growth records, mental tests, ratings, controlled observations, used in the experimental study of the young child. Practical exercises and problems on institute records and data.
170. Parental Education in Child Care and Training. A consideration of the content and methods used in courses and study groups for parents in the care and training of young children. Lectures, discussions, and reports.
- 173-174. Technique and Practice of Parental Education. Field work in the technique of organizing and conducting parental study groups and courses for the study of the young child.
- 190-191. Mental Examination of Pre-school Children. A study of the methods used in testing young children together with practice in such testing.

DAIRY HUSBANDRY

1. Elements of Dairying. Lectures and demonstrations with opportunity for laboratory practice. The history and development of the dairy industry. Milk, its composition, chemical and physical properties with relation to the handling of milk and the manufacture of milk products. Dairy arithmetic.
2. Dairy Bacteriology. Lectures and laboratory exercises. Types of milk organisms; the contamination of milk and how prevented; relation of milk to the public health; the bacteriology of dairy products.
3. Dairy Bacteriology. Same as Course 2, without laboratory.
4. Dairy Products Practice. A study of factory methods. Includes a minimum of one month's practical experience in a plant handling dairy products in a factory way. Reports and records of work done required.
7. Dairy Stock Selection. Selection by type, pedigree, and production records.
101. Milk Production. Problems of the dairy farmer, such as characteristics and adaptations of dairy breeds; selection and management of dairy herd and sire; calf raising; dairy barns.

102. Market Milk. Lectures and laboratory work. Classes of market milk; transportation and distribution; sanitary inspection; equipment and operation of plants; problems of public control.
103. Dairy Stock Feeding. Application of principles of nutrition to feeding the dairy cow and growing young animals. Feeding standards; characteristics of various feeding stuffs; formulation of rations.
104. Dairy Cattle Breeding. Application of the principles of genetics to the improvement of dairy cattle. Evaluation of breeding animals and formulation of breeding plans.
105. Seminar I. Special investigation and study of selected topics. Each student presents papers and reports on assigned subjects and reviews recent scientific investigations along dairy husbandry lines.
106. Seminar II. Continuation of 105.
110. Dairy Products III. The manufacture of ice cream with special reference to the chemical and physical processes involved. Organization, construction, equipment, and operation of such factories. Laboratory exercises and lectures.
111. Dairy Products I. The manufacture of butter with special reference to the chemical and bacteriological processes involved. Organization, construction, equipment, and operation, in such factories. Laboratory exercises to illustrate these processes.
112. Dairy Products II. The manufacture of cheese, condensed and powdered milks with special reference to the chemical, bacteriological, and physical processes involved. Organization, construction, equipment, operation of such factories. Laboratory exercises and lectures.
113. Technical Control. Lectures and laboratory. Chemical and bacteriological laboratory methods used in technical control of milk and its products. Use of Mojonnier tester, cryoscope, and bacteriological control methods.
115. Advanced Dairy Bacteriology. Investigations of specific problems on the bacteriology and mycology of milk and dairy products.

ECONOMICS

SCHOOL OF BUSINESS ADMINISTRATION

For courses and course descriptions see the bulletin of the School of Business Administration.

See also courses in Agricultural Economics.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

COLLEGE OF EDUCATION

119. The Elementary School Curriculum.

For additional courses and course descriptions see the bulletin of the College of Education.

EDUCATIONAL PSYCHOLOGY

COLLEGE OF EDUCATION

55. Educational Psychology.

111. Educational Measurements in the Elementary School.

For additional courses and course descriptions see the bulletin of the College of Education.

ENGLISH

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

21-22-23. Introduction to English Literature.

31-32. Development of the English Novel.

33. The Later English Novel.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

Courses in this department are closely correlated with those offered by the Department of Zoology of the College of Science, Literature, and the Arts. Courses 117-118-119, 125-126-127, 139-140, 144-145-146, and 197 of this division are also offered under these numbers by the Department of Zoology.

For introductory course in general entomology see Zoology 16.

6. Forest Entomology. Lectures and laboratory work dealing with the principles of controlling insects that attack trees and forest products, together with a consideration of the life-history and habits of important representative species.
7. Vertebrate Taxonomy. Lectures and laboratory work. Principles of taxonomy, scientific names, and rules of nomenclature. Diagnostic characters, field marks, and distribution of the various vertebrates of the state.
9. Elementary Bee Science. Classification, structure of *Apis mellifica*. Development and life-history of the queen, worker, and drone. Organization of the colony. Colony instincts and activities. Breeding, swarming, hibernation.
10. Industrial Beekeeping. Bees as honey producers and pollinators. Beehives, tools, and appliances. Bee shop. Location. Handling bees; spring management, swarm control. Production of comb and extracted honey. Food sources. Increase. Wintering. Diseases and enemies.
11. Advanced Beekeeping I. Problems of the commercial beekeeper. Out apiaries. Management. Marketing. Organization of the industry. Grading of bee products. Bee disease control.
12. Advanced Beekeeping II. Queen breeding, races of bees, package bees, nuclei, increase.
13. Field Zoology. For forestry freshmen at Itasca Park.

51. Introductory Parasitology. An elementary course dealing with parasitic Protozoa, worms and arthropods and their relation to diseases of man and animals.
52. Introductory Entomology. General characters, classification, and habits of insects.
63. Economic Entomology. The life-histories, habits, and methods of control of the insect pests of orchard, field, and garden. Laboratory work in the determination of the more important forms.
64. Economic Vertebrate Zoology. Lectures and library work. Deals with the various vertebrates of Minnesota, their habits and economic status, and means by which their numbers may be controlled.
65. Economic Entomology. Same as Course 63 only more inclusive.
67. Varieties and Habits of Fur Bearing Animals. Distinguishing characters and life-histories of the various mammal groups, particularly those represented in the state. Consideration is given to the possibilities of fur farming in case of certain species.
68. Methods in Field Zoology. Lectures and laboratory work. Frequent field trips. Use of field data, cover mapping, vertebrate census methods, collection and care of specimens, cataloging and study of field sign.
- 117-118-119. General Ecology of Insects. General ecology with special reference to the insects of Minnesota. Frequent field trips. Lectures, laboratory, and field work.
- 125-126-127. Advanced General Entomology. Advanced work in the lines of morphology and classification of insects with lectures on the history of entomology. Lectures and laboratory.
- 139-140. Histology and Development of Insects. Lectures and laboratory work on the histology, embryonic and postembryonic development of insects. Individual work along these lines is available to properly qualified students in Course 197.
- 141-142. Insects in Relation to Plant Diseases. A study of the principal insect vectors and their habits.
- 144-145-146. Animal Parasites and Parasitism. Lectures and laboratory work. Origin and biological significance of parasitism; structure, life-history, and economic relations of representative parasites. Second term devoted primarily to the relation of insects to diseases of man and animals.
175. Insecticides and Their Action. A study of the chemical composition, the physical properties, and the physiological action of standard, of little known, and of new insecticides.
- 176-177. Advanced Economic Entomology. A critical consideration of the principles of insect control and the history of their development.
197. Introduction to Research. Preparation for investigational work in lines of entomology, parasitology, ecology, economic zoology, or bee-keeping. Advanced laboratory, field, and library work; training in preparation of bibliographies and manuscripts; special problems. Summer work should be planned when possible.

FORESTRY

1. General Forestry. A brief history of the development of forestry in Europe and America; its bearing on the forestry problems of the United States; description of the United States forests. Lectures and collateral reading.
2. Field Dendrology. Trees and shrubs found in Itasca Park, with special reference to identification by means of gross characters.
- 3-4. Dendrology. The forest trees of the United States; their classification, characteristics, and range, with special attention to prominent and constant characteristics. Lectures, assigned reading, laboratory.
5. Field Silviculture. Largely field work designed to give the student a working knowledge of the forest. Includes silvicultural study of the species found in the north woods and the general principles underlying silvicultural reconnaissance
6. Field Mensuration. Largely field work. Includes elementary work in timber cruising, valuation surveys, stem analysis, and the study of the measurements of stand, volume, and yield; use of compass, pacing and mapping.
- 7-8. Forest Mensuration. The basic principles underlying the measurement of forest products. Measurement of standing and felled timber. Special attention is given to log rules, preparation and use of volume and yield tables, and growth of trees and stands.
20. Grazing. History of grazing in the West. Kind of stock used. Forage plants. Regulations and methods of handling stock. Range management and protection. Lectures, recitations, and reading.
23. Factory Experience. Time actually spent in work and study in an approved wood using industry. Complete detailed report is required.
27. Farm Wood Lots and Windbreaks. Trees and their relation to the farm. Planning and planting farm windbreaks and shelterbelts. Utilization and marketing of farm, grove, or woodlot products.
28. Logging. The principles and general methods of operation in the United States, and the modifications required by forest management.
29. Sawmill and Woodworking Machinery. Sawmills, woodworking machinery, and the processes in the primary manufacture of lumber products.
30. Wood Seasoning. The theory and practice of air seasoning and kiln drying of wood.
31. Logging Laboratory. The student will spend at least one week in an approved logging camp and make a complete report of the operation.
32. Forest Reports. This course is intended to assist the forester in the collection, selection, arrangement, and presentation of scientific data in the form of reports through practice writing and individual conferences.
- 33-34. Wood Structure and Identification. Structure, classification, and identification of the domestic commercial woods. Lectures, reading, laboratory.

37. Forest Protection. The protection of forest from fire—fire prevention, and fire suppression. The causes of forest fires and their elimination, climate and fires, fire fighting and fire legislation.
48. Forest Products. An introductory survey of the products of forests other than lumber as naval stores, tannins, wood pulp, paper, etc. Lectures, reading, reports.
50. House and Furniture Woods. The woods used in house construction and finish, furniture, etc. Their identification and properties. Lectures and laboratory.
57. Uses of Wood I. The economic hard and soft woods, both foreign and domestic from standpoint of production, distribution, qualities, amounts, and prices in relation to the wood using industries. Lectures, reading, reports.
58. Uses of Wood II. A continuation of Course 57 dealing with the industries and the woods they use. Kinds, grades, qualities, properties, requirements for each product. Use, re-use, distribution of product. Regions of production and relation to other industries. Lectures, reading, reports.
59. Uses of Wood III. The actual use of wood in the industries. At least six hours per week must be spent in actual study in a factory. Complete reports and collateral reading.
101. Advanced Dendrology. A continuation of Course 3-4 with special studies in classification and distribution of the timber species of the world.
- 111-112. Advanced Forest Mensuration. Continuation of Course 8 with special emphasis on the construction of alinement charts, and correlation as applied to problems in forest mensuration.
113. Wood Pulp and Paper. Cellulose and its properties. Methods of production of wood pulp and paper products. Lectures, reading, reports.
- 114-115. Mechanical and Physical Properties of Wood. Derivation and application of the formulas used in determining stresses in wood. Laboratory methods in timber physics. Lectures, laboratory, reading, and reports.
116. Mechanical and Physical Properties of Wood. Study of the physical properties of wood. Shrinkage, relation of strength to moisture content, etc., and their bearing on wood utilization. Laboratory reading and reports.
119. Advanced Wood Structure I. The microtechnique of woody tissues. Lectures, reading, and laboratory work.
120. Advanced Wood Structure II. Advanced study of the anatomy of woody plants. Reading, laboratory, and reports.
- 122-123. Forestry Seminar. Assigned topics with special reference to current forest problems.
125. Wood Preservation. Lectures and collateral reading upon the history, development, and methods of wood preservation. Different systems now in use and preservatives used.

126. Silvics. The fundamentals forming the basis of silviculture with special attention to the sylvics of the important tree species. Lectures, readings, and required papers.
127. Silviculture. A study of the general principles underlying the art of silviculture, and a brief study of European methods as applied to American conditions.
128. Silviculture Laboratory. Nursery practice and field planting. Preparation of a silvicultural plan for a small tract of timber and the application of that plan.
129. American Silvicultural Practice. A study of the silvicultural methods now being employed in the United States and the probable results of the application of other European methods. Lectures, references, and discussion.
130. Forest Valuation. The business of forest management. A study of the different factors entering into the valuation of forest property.
131. Forest Policy and Administration. Policy of the United States and the states toward the utilization of the public forest resources. Policy of other owners toward forest resources controlled by them. Administration of the national and state forests.
132. Forest Regulation Laboratory. Field work. The collection of the data necessary to working up a forest working plan. Includes the making of the timber estimates, growth studies, and maps necessary to a forest working plan.
- 134-135. Forest Problems. The preparation of a report on some phase of forestry work. This report may include the results of some original investigation, or it may consist in collecting and arranging facts and the drawing of proper conclusions from these facts.
136. Forest Economics. The place of the forest in the productive utilization of land; past and present markets and source of supply of timber and timber products, particularly with reference to the present situation in North America.
140. Forest Working Plans. A study of methods of regulating and allotting the cut from a forest under management. Preparation of a working plan. Lectures and reports.

GEOLOGY AND MINERALOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

1. General Geology
2. Historical Geology.
3. Economic Geology
 - A. General Geology Laboratory.
 - B. Historical Geology Laboratory.
 - C. Economic Geology Laboratory.
8. Introductory Geology.
- 23-24. Elements of Mineralogy.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

GERMAN

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

1. Beginning German A.
2. Beginning German B.
3. Beginning German C.
4. Intermediate German.
- 24-25-26. Chemical German.
- 30-31-32. Medical German.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

HISTORY AND PHILOSOPHY OF EDUCATION

COLLEGE OF EDUCATION

1. A Brief Course in the History of Education.
3. Educational Sociology.
5. Public Education in the United States. A survey of factors determining public education in the United States followed by a study of the development of educational theory and the rise of state systems.

For additional courses and course descriptions see the bulletin of the College of Education.

HOME ECONOMICS

3. Textiles. Textile fibers, their structure, properties, and chemical reactions; fabrics, their structure and processes of manufacture; art and economic consideration in selection and purchase of materials for clothing and household furnishing.
4. Textiles. See bulletins of the Colleges of Science, Literature, and the Arts and Education.
11. Clothing Planning and Construction, A. Provides instruction and practice in planning, buying, cutting, fitting, and making of garments of washable materials; sewing machines, care and use; commercial patterns, interpretation and adaptation.
13. Clothing Planning and Construction, B. Laboratory practice in costume modeling; preparation of dress form; adaptation of textile and art principles in selection of materials and design; instruction and practice in construction of a semi-tailored wool garment and of infant's or children's garments.
15. Clothing Problems. A consideration of the individual clothing budget; care of clothing; clothing in relation to health; the selection of ready-to-wear clothing; children's clothing. Talks by store people and trips to stores and clothing factories are arranged for.
16. Problems in the Remodeling of Garments and Construction of Children's Clothing. Laboratory practice in remodeling coats, dresses, and hats; problems in making children's garments.

17. Advanced Clothing. Laboratory course in the designing, modeling, and construction of silk or wool costume, including millinery; one problem to test acquired speed.
18. Commercial Clothing Manufacture. Laboratory practice upon commercial basis. Shop organization, with problems involving clothing design and construction.
34. Home Management: Operation and Maintenance, Lectures. Discussion of the managerial aspects of homemaking with special emphasis upon problems involved in the use of time, energy, and money.
35. Home Management: Operation and Maintenance, Laboratory. Actual experience in a home management house with various household management problems including the care and development of a child of pre-school age.
44. Home Economics Extension Work. Study of the objectives, organization, and functioning of home economics extension service in Minnesota and elsewhere. Observation of work in the Twin Cities. Discussion and conferences.
- 50-51. Color and Design. The principles of color and design related to such problems as selecting and designing costumes and selecting, arranging, and designing house furnishings.
53. Related Art Problems. Principles discussed and problems worked out relating to costume and house furnishing design.
55. Decorative Needlework and Other Crafts. Applied design in needlework the major interest. Other crafts given consideration such as block printing, to be worked out in such problems as book ends, blotter pads, folios.
56. Applications of Color and Design. See Course 50-51.
57. Batik and Other Crafts. Principles of design and color harmony applied to batik and such other crafts as leather tooling, tie dyeing, and lamp shade making. Articles are planned to relate to definite dress and home furnishing problems.
60. Institution Marketing. Problems involved in the purchasing of foods on a large quantity basis. Factors in the production, distribution, and sale of commodities which affect the wholesale buyer.
61. Quantity Cookery. Application of the principles of cookery to large quantity preparation; planning of meals for dining hall, cafeteria, and tea room; a study of standardized formulae and production costs.
63. Institution Experience. Experience in the minor problems of cafeteria, dining hall, and tea room administration.
65. Institution Equipment. Equipment for the institution food department; materials, construction, operation. Placing of equipment in relation to the routing of work within the unit and in relation to the work of other departments.
70. Nutrition Survey. Selection of food from a nutritional standpoint and the relation of food to health and efficiency.
71. Social Interpretations for Dietitians.

73. Nutrition I. (1) The nature and properties of groups of compounds occurring in the cell and in food, (2) digestion, and (3) absorption.
75. Dietetics Laboratory. (1) Food values, (2) problems relating to the selection of food under conditions of health and under such pathological conditions as are treated by diet.
79. Selected Problems for Dietitians. A selected group of problems related to the work of the dietitian involving discussions, assigned readings, and field trips.
80. Food Preparation. The development of technique and the application of fundamental science principles to cookery processes. The establishment of good standards for food products.
81. Food Preparation. A three-credit course open by examination to a limited number of students. See Course 80.
83. Food Management. Determination and study of the management factors involved in the food problems of the homemaker.
85. Food Marketing. Food problems of the consumer. A study of the quality and cost of foods on the market. Laboratory and field work.
89. Camp Cookery. Simple cookery processes with adaptations to out-of-door cookery. Laboratory and field work. Not open to home economics students. For prospective foresters, engineers, and others. (Given in alternate years. Offered in 1932-33.)
90. Home Management Problems for Social Workers. The management of the home in relation to the economic and social status of the family, special consideration being given to the dependent family.
102. Advanced Textiles. An intensive study of textile materials with special reference to the following: nature of the raw materials; economic, chemical, and physical applications involved in their manufacture and use; methods and significance of physical testing.
107. Textile Analysis. Problems and application of quantitative methods in textile analysis with special reference to establishing standards for fabrics.
115. Clothing Economics. A study of the economic aspects of clothing which directly or indirectly affect the consumer.
131. Home Management: House Planning and Equipment. Study of the small house which aims at more intelligent planning in building and furnishing. House plans, kitchen arrangements, and equipment of house studied from homemaker's point of view of economy, convenience, and beauty.
136. Problems in Income Management. An intensive study of problems relating to individual and family budgets. Readings, discussions, and field work.
150. Art History and Appreciation. The historical development of painting, sculpture, architecture, decoration, furniture, and costumes, studied with special emphasis on design and influence upon modern styles.
152. Advanced Interior Design. Special problems of small house decoration involving execution of elevation drawings. Studies and reports on topics of practical and historical interest. Actual materials will be used as far as possible.

154. Advanced Costume Design. Study of figure construction. Relation of color and texture to dress design. Studies and reports on assigned topics. Laboratory work with fabrics. Designs in pencil and water colors.
163. Institution Management Problems. Problems affecting the efficient administration of the institution; departmental organization, operation, maintenance; employment problems; business policies. Field trips to various types of institutions.
170. Nutrition of the Family. The fundamental principles of human nutrition as applied to the feeding of individuals and groups under conditions of health.
171. Child Nutrition. Lectures, discussions, and field work dealing with the principles of child nutrition and with the formation of desired food habits.
173. Nutrition in Disease. A study of the fundamental principles involved in using diet in the treatment of certain diseases.
175. Nutrition II. Metabolism including work on tissues, blood, milk, and urine.
176. Advanced Nutrition. Selected quantitative methods applicable to investigations relating to digestion and metabolism.
177. Digestion and Metabolism. An intensive study of problems relating to digestion and metabolism involving lectures, readings, demonstrations, and laboratory work.
178. Clinical Problems in Nutrition. The application of nutrition information to problems in health and disease involving assigned readings, discussions, and experience in a clinic or with case work.
179. Readings in Nutrition. A course designed to give intensive experience in the use of nutrition books and periodicals, involving assigned readings, oral and written reports.
182. Experimental Cookery. An intensive study of problems in foods and food preparation with individual laboratory problems.
186. Special Food Problems. Individual problems in foods and food preparation.
187. Special Food Problems. The same as Course 186 with additional problems.
195. Home Economics Survey. A discussion of the historical development of home economics with special emphasis upon current problems.

HOME ECONOMICS EDUCATION

COLLEGE OF EDUCATION

Students expecting to receive a teacher's certificate upon graduation shall be registrants in the College of Education from the beginning of the junior year. No formal application is necessary to register in the College of Education if specialization in one of the teachers' courses is desired at the beginning of the junior year. However, no student may transfer who has not earned a minimum of 90 credits and at least one honor point per credit.

40. Child Training. A brief study of the physical and mental development of the child is followed by a discussion of the problems of training small children. Emphasis is placed on the pre-school child. Lectures, observations in the Nursery School, and reports.
- 42.¹ Special Methods and Observation of Teaching Home Economics. The psychological bases for teaching; the investigation and collection of facts on teaching situations through study, observation of school classes, and conferences on teaching problems. Required of all students preparing to teach.
- 49.¹ Supervised Teaching of Home Economics. The application of psychological facts and principles to teaching situations. Actual teaching experience under supervision.
- 49a.¹ Observation and Supervised Teaching of Home Economics. The study of facts and principles as they apply to teaching situations. Observation. Teaching under supervision. (Only for those taking H.E.Ed 42su.)
141. Vocational Education in Home Economics. The place and development of home economics in the vocational education program. Study of the problems of the all day, evening, and part time schools.
142. Educational Measurement in Home Economics. Problems of measurement in home economics; home economics tests and scales; construction and evaluation of objective tests.
143. Home Economics Curricula. The objectives of home economics in the junior and senior high schools; recent surveys and other investigations used in determining curricular content; home economics courses of study.
147. Organization and Methods for Related Art Teaching. Organization of a related art course and methods of teaching art principles as applied to familiar objects and processes.
149. Research Problems. A study of the methods used in collection, treatment, and interpretation of data in the field of home economics.

HORTICULTURE

6. Fruit Growing. The fundamental principles of fruit growing. Sites, soils, nursery stock, planting and planting plans, tillage, fertilization, cover crops, pollination, frost avoidance, pruning, and thinning. Lectures, recitations, references, and laboratory work.
32. Vegetable Growing. The fundamental principles of vegetable growing. Scope of the industry and its place in agriculture. Varieties, seed production, regional adaptation, soils, fertilizers, equipment, storage, systems of production, and marketing.
50. Floriculture. Designed to give the student a working knowledge of the propagation, culture, and uses of the common house and greenhouse plants. Lectures, reference reading, and laboratory.
51. Garden Flowers. A study of the common annuals, biennials, and perennial flowers, with special emphasis on plants for the perennial border and rock garden. Lectures, reference reading, and laboratory.

¹ A special fee of \$1 per credit hour is charged for this course.

52. Commercial Floriculture—Fall Crops. A study of the culture of the principal florists' crops with major emphasis on chrysanthemums, carnations, and cut flowers and potted plants, especially adapted to Christmas sales. Lectures, reference reading, laboratory, and field trips to greenhouses and flower stores.
53. Conservatory Plants and Florists' Flowers. A systematic study of the plants adapted to growing in conservatories and homes, and also of florists' cut flowers and potted plants. Lectures, laboratory, and field trips to greenhouses.
54. Commercial Floriculture—Spring Crops. A study of the culture of the principal florists' crops with major emphasis on roses, bulbous plants, the minor cut flower crops, and bedding plants. Lectures, reference reading, laboratory, and field trips to greenhouses and flower stores.
56. Plant Propagation. Methods of propagating plants by seed, cuttings, layers, and grafting. Practical work in management of nursery stock, bulbs, and plants. Lectures, reference reading, and field trips.
71. Elementary Landscape Design and Plant Materials. The elementary principles of landscape design; identification of evergreen and deciduous trees, shrubs, and vines, with special emphasis on their fall and winter characters and their uses in landscape design. Lectures, outdoor and indoor laboratories, field trips.
72. Woody Plants and Garden Flowers. Deciduous and evergreen trees, shrubs and vines, from their winter and spring characters; with special emphasis on their flower characters; herbaceous annuals, biennials, perennials, including bulbs and their uses in landscape planting; spring and summer characteristics; use in landscape gardening. Lectures, indoor and outdoor laboratories, field trips.
74. Principles of Landscape Design. The composition of the various elements used in landscape gardening, methods of presentation. Lectures and problems.
75. Landscape Problems. The planning and planting of home properties for the city and country. Lectures, field trips, and reports.
76. Landscape Construction. Construction and maintenance of turf for lawns, golf courses, and other play areas; garden architecture, grading, planting and care, costs of construction. Lectures, field trips, and reports.
93. Judging Horticultural Crops. The principles and practice of judging and exhibiting fruits, vegetables, and flowers.
107. Orchard Management. A detailed study of the various operations in orchards and berry fields. Operating costs and profits. Lectures, laboratory, and individual problems.
110. Horticultural Crop Breeding. Applied genetics are emphasized. The method of breeding each of the important horticultural crops with special attention to experiment station investigations and to the methods used by plant breeders.

111. Systematic Pomology. Fruit varieties. Classification, description, identification, and elements of judging. Lectures, laboratory, and a survey of the literature.
121. Small Fruit Culture. Cultural practices for each of the small fruits. Brief consideration is given to their botanical relationships and the history of their commercial development. Lectures, problems, and survey of literature.
135. Truck Crops and Potatoes I. Truck crop production as an applied science. The crop or the plant is used as the unit of consideration and the sciences are used to explain cultural practices and plant behavior.
137. Truck Crops and Potatoes II. Continuation of Course 135.
- 190-191-192. Special Problems. Problems based upon the work given in the preceding courses.
- 193-194. Horticultural Seminar. Reports and discussions of problems and investigational work.

INORGANIC CHEMISTRY

SCHOOL OF CHEMISTRY

- 1-2-3. General Inorganic Chemistry.
- 9-10. General Inorganic Chemistry.
11. Qualitative Chemical Analysis.

For additional courses and course descriptions see the bulletin of the School of Chemistry.

MATHEMATICS

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Placement tests.—In each of Courses 3, 4, 5, and 8, a placement test will be given at the *first meeting* of the class. Students who fail in this test will be advised to take a more elementary course. It is especially important to attend the first meeting of the class promptly. Late registrants must take the test before entering the class.

3. Higher Algebra, Short Course.
4. Trigonometry, Short Course.
5. Higher Algebra.
6. Trigonometry.
7. College Algebra.
8. Commerce Algebra.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

MILITARY SCIENCE AND TACTICS

Students who have completed the Basic Course, R.O.T.C., may be selected for advanced work by the professor of military science and tactics. Those who pursue the Advanced Course are required to sign an agreement with the government to continue the two years' course to completion. This

includes attendance at a training camp, held normally during the summer following the first year's advanced work. The camp is conducted free of cost to the student, and in addition, while actually in camp, the student receives the pay prescribed for the seventh grade in the army. Students pursuing the Advanced Course are also furnished a special uniform and receive a fixed allowance per day. The total government compensation for the two years' advanced work amounts to something over \$200. Students who satisfactorily complete the Advanced Course will be commissioned in the Officers' Reserve Corps of the United States Army. The University allows 18 credits for the two years' advanced R.O.T.C. work.

1-2-3. First Year Basic Course R.O.T.C. Practical instruction in schools of soldier, squad, platoon, company, and battalion; ceremonies, rifle marksmanship, military courtesy, military hygiene and first aid, physical drill.

4-5-6. Second Year Basic Course R.O.T.C. Practical and theoretical instruction in schools of company and battalion; scouting and patrolling, musketry, interior guard duty, automatic rifle, combat principles, rifle squad.

51-52-53. First Year Advanced Course R.O.T.C. Military sketching and map reading, drill and command, machine guns, 37-millimeter and 3-inch trench mortar, and combat principles, rifle section, and platoon.

54-55-56. Second Year Advanced Course R.O.T.C. Military law and O.R.C. regulations, military history and policy, administration, field engineering, drill and command, combat principles, rifle and machine gun companies, and howitzer company platoon.

MUSIC

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Credit is offered to students in the College of Agriculture, Forestry, and Home Economics who may wish to elect work in the Department of Music. Nine credits may be obtained.

3-4-5. Harmony.

11. First Year Pianoforte.¹

12. Voice.¹

13. Violin.¹

14-26. Other Orchestral Instruments.¹

27. Organ.¹

40-41-42. Orchestra.

43-44-45. University Chorus.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

¹ For special and practice fees for these courses see bulletin of general information.

ORGANIC CHEMISTRY
SCHOOL OF CHEMISTRY

51-52-53. Organic Chemistry.

For additional courses and course descriptions see the bulletin of the School of Chemistry.

PHYSICAL CHEMISTRY
SCHOOL OF CHEMISTRY

101-102-103. Physical Chemistry.

For additional courses and course descriptions see the bulletin of the School of Chemistry.

PHYSICAL EDUCATION FOR MEN¹

A physical examination is required of all new matriculants, and of all others using the department privileges, at the beginning of the year, and as often during their college course as their physical condition may indicate.

For a special four-year professional course in physical education and athletic coaching, see bulletin of the College of Education. Students interested in this course should consult the department before registering.

Not more than nine credits in courses in physical activities may be counted toward graduation.

1-2-3. Freshman Physical Education.

4. Freshman Hygiene. Required of all freshmen.

7-8-9. Advanced Leaders.

10-11-12. Minor Sports.

16-17-18. Drill Substitution. (By petition only.)

30. Athletic Training and First Aid.

For additional courses and course descriptions see the bulletin of the College of Education.

PHYSICAL EDUCATION FOR WOMEN²

This department aims to promote the physical efficiency of the women students. It gives physical examination and advice to all on entrance, plans systematically to keep in close touch with them during their first two years of residence; conducts yearly consultations with, and examines when necessary; all upper class students; gives courses in hygiene; organizes neuromuscular activity leading toward organic strength, nervous stability, conscious motor control, correct body mechanics, skill in handling the body and in physical recreation, and the development of that valuable social quality

¹ For all courses, except 4, 7-8-9, \$1.50 per quarter. Maximum fee, \$1.50 per quarter.

² Elementary physical training, \$2.50 a quarter. All other exercise courses, including swimming, for which registration is required, except Courses 4 and 24, \$2 a quarter. Maximum fee paid by a student in physical education, \$3.50 a quarter. No gymnasium fee is charged for Courses 4 and 24.

known as good sportsmanship; co-operates closely with the Women's Athletic Association in encouraging and organizing athletic sports; holds regular office hours for the purpose of consultation with all students who desire its advice.

Work in this department is required of all newly entering students (see Course 1-2-3), and of all sophomores who cannot pass the swimming examination (see Course 22-23). Physical examinations or consultations required annually of all students.

Six credits is the maximum number that can be gained toward the degree by taking courses in exercise (Courses 41, 42, 43, 45, 66-67-68, 69-70-71).

For a special four-year professional course designed to prepare graduates for the responsible direction of physical education activities see bulletin of the College of Education.

1-2-3. Elementary Physical Education. Orientation toward outdoor and indoor physical education activities through fundamental elements and principles, and their application in organized activity. Orthopedic exercise. Individual health conferences.

4. Preliminary Hygiene. One lecture a week. The most essential aspects of the care of the personal health. For nurses and transfer students.

7-8. Sophomore Gymnastics.

9. Sophomore Archery.

10-11-12. Sophomore Orthopedic and Individual Gymnastics.

13-14-15. Sophomore Dancing.

16-17. Sophomore Games and Folk Dancing.

18. Tennis.

19. Sophomore Hockey.

20. Sophomore Basket-Ball.

21. Sophomore Baseball.

22-23. Sophomore Elementary Swimming.

24. Sophomore Horseback Riding.

25-26. Sophomore Intermediate and Advanced Swimming.

27. Sophomore Golf.

30. Sophomore Life Saving and Water Sports.

31. Sophomore Skating.

For additional courses and course descriptions see the bulletin of the College of Education.

PHYSICS

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

3. Elements of Mechanics and Sound.

4.¹ Elements of Mechanics Laboratory.

13. Acoustics.

23. Heat.

24.¹ Heat Laboratory.

33. Optics.

¹ A laboratory fee of \$2 is charged for this course.

- 34.¹ Optics Laboratory.
- 43. Magnetism and Electricity.
- 44.¹ Electrical Laboratory.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

PHYSIOLOGY MEDICAL SCHOOL

- 4. Human Physiology. Elementary course. For academic, home economics, pharmacy, and other students. Lectures and demonstrations.
- 56. Physiologic Chemistry. Intermediate course.
- 57. Physiologic Chemistry. Intermediate course.
- 59. Human Physiology. Intermediate course.
- 60. Physiology of Exercise. Intermediate course.
- 100-101. Physiologic Chemistry.
- 103. Physiology of Muscle, Nerve, Blood, Circulation, and Digestion.
- 104. Physiology of the Nervous System and Special Senses.

For additional courses and course descriptions see the bulletin of the Medical School.

PLANT PATHOLOGY AND BOTANY

- 1. Plant Pathology. An introductory course in plant diseases. Lectures, laboratory, and reference. Not open to those who have completed Course 10.
- 7-8. Weeds and Grasses. Agricultural and applied botanical study of weeds and grasses with special reference to agricultural importance.
- 9. Weeds and Seed Testing. Detailed study of seed testing methods and seed legislation. Weed and crop seeds and weed plants studied with special reference to identification.
- 10. Forest Pathology. Diseases of forest and shade trees, and the rotting of timber. Symptoms, etiology, and control. Lectures, laboratory, and reference work. Not open to those who have completed Course 1.
- 12. Seed Problems. Special seed problems are assigned. Advanced work in seed testing methods.
- 105-106-107. Mycology. Morphology and taxonomy of fungi. Lectures, laboratory, and field work.
- 110. Principles of Pathology. Physiology of plant pathogens; parasitism, physiological specialization, host reactions, predisposition, resistance, and immunity.
- 111. Diseases of Cereal Crops. Detailed study of diseases of cereal crops, including symptomatology, etiology, and practical methods of control. Laboratory, lecture, and field work.
- 112. Diseases of Fruit Crops. Special study of diseases of fruit crops, especially those important in Minnesota. Laboratory, lecture, and greenhouse work. (Given in alternate years. Offered in 1932-33.)

¹ A laboratory fee of \$2 is charged for this course.

113. Diseases of Vegetable Crops. A detailed study of diseases of potatoes and other vegetable crops. Lectures, reference, laboratory, and greenhouse work. (Given in alternate years. Not offered in 1932-33.)
114. Advanced Forest Pathology. A detailed study of wood rots, including a study of the deterioration of wood products caused by fungi. Lectures, laboratory, and greenhouse work. (Given in alternate years. Not offered in 1932-33.)
116. Pathologic Histology. A study of the histological changes in diseased plants. Lectures, laboratory, and reference work. (Given in alternate years. Not offered in 1932-33.)
117. Diseases of Forage and Fiber Crops. Symptomatology, etiology, and methods of control. Lectures, laboratory, and field work. (Given in alternate years. Not offered in 1932-33.)
118. Bacterial Diseases of Plants. Bacteria as plant pathogens; representative types with particular reference to technique used in studying bacterial diseases of plants. Lectures, laboratory, and greenhouse work. (Given in alternate years. Offered in 1932-33.)
119. Principles of Plant Disease Control. Methods of plant disease control by means of exclusion, eradication, protection, and immunization. Lectures, laboratory, and reference work. (Given in alternate years. Offered in 1932-33.)
- 141-142. Insects in Relation to Plant Disease. A study of the principal insect vectors and their habits; types of insect injuries affecting health of plants; modes of insect transmission, and dissemination of plant disease; methods of rearing and handling insect vectors.
160. Plant Microchemistry. The localization, identification, and function of plant constituents. Lectures, demonstrations, and laboratory.
161. Transport, Storage, and Ripening of Fruits and Vegetables. The effects of temperature, respiration, packing, etc., on storage life.
162. Physiological Relation of Crop Plants to Temperature. An advanced study of general temperature effects and especially of the relation of plants to low temperatures. Lectures, readings, and translations.

POLITICAL SCIENCE

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

- 1-2. American Government and Politics.
- 51-52-53. Business Law. (See bulletin of the School of Business Administration.)

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

POULTRY HUSBANDRY

1. Poultry. The importance and extent of the poultry industry, market products, principles of house construction, methods of care and management, feeding for egg production.

2. Poultry Judging. The origin, standard requirements, and common defects of the leading commercial standard breeds and varieties and determination of standard values by the score card and comparison methods.
4. Incubating and Brooding. Instruction and practice in incubation and brooding, selection of breeding stock and eggs for hatching, and feeding young chicks. Of practical value to teachers of agriculture and poultry raisers.
5. Advanced Poultry Judging. Practice in close selection for high egg production; for standard values of different color patterns and principal standard types; mating to produce high standard quality.
6. Poultry Problems. Special problems and research in the field of poultry industry.
101. Advanced Poultry Breeding. Principles of genetics applied to poultry breeding; a survey of inheritance in the fowl; fecundity, physiology of reproduction in the fowl.

PREVENTIVE MEDICINE AND PUBLIC HEALTH

MEDICAL SCHOOL

3. Personal Hygiene and Elementary Sanitation.
52. Health Care of the Family. First aid; communicable diseases, their transmission and prevention; hygiene of infancy, maidenhood, maturity. The care of the sick room; observation and care of the patient. Elementary symptomatology. Arranged for students of home economics.
57. Health of Infant and Pre-school Child.
60. Tuberculosis and Its Control.
61. Mental Hygiene.
73. Occupational Hygiene and Disease.
80. Health Supervision of School Child.
102. Sanitation.
103. Public Health Bacteriology.

For additional courses and course descriptions see the bulletin of the Medical School.

PSYCHOLOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

- 1-2. General Psychology.
3. Psychology Applied to Daily Life.
- 4-5. Introductory Laboratory Psychology.
7. Introductory Laboratory Psychology.
9. Introduction to Animal Psychology.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

PUBLICATIONS AND RURAL JOURNALISM

- 10-11-12. Agricultural Journalism. Intended for students who may wish to enter the field of agricultural journalism as a profession.

19. *Publicity.* For students planning careers in agriculture or some allied industry, in which the co-operation of the press will be needed.

For additional courses see the Department of Journalism in the bulletin of the College of Science, Literature, and the Arts.

RHETORIC

Rhetoric credits will not be granted officially until the close of the second quarter of the senior year.

Any instructor who finds that a student is deficient in English will submit the name of the student together with the evidence to the chairman of the Students' Work Committee. If the evidence warrants, the committee will send the student to the Section of Rhetoric for such additional work in English as is needed. This work the student must take, without credit, to validate his freshman and sophomore rhetoric credits.

Students whose work in rhetoric courses shows at any time an inadequate knowledge of the conventions of English will be required to enter a class in elementary rhetoric.

1. *Rhetoric I.* Note taking, gathering and organizing material, oral and written exposition, paragraph structure, supplementary reading.
2. *Rhetoric II.* Sentence structure, diction, exposition, news articles, supplementary reading.
3. *Rhetoric III.* Description, narration, news articles, supplementary reading.
11. *Argumentation.* Gathering evidence, reasoning, briefing, formal and informal argument, persuasion, debating.
22. *Public Speaking.* (3-hour course.) A practical course in fundamentals of speech making.
23. *Public Speaking.* (5-hour course.)
24. *Advanced Public Speaking.* Types of audiences, persuasion, voice, extemporaneous speeches for special occasions.
28. *Play Production.* History of the theater, theories of acting, staging, etc. A survey of the problems confronting the producer of amateur plays.
29. *Advanced Play Production.* Continuation of Course 28. Problems of directing, staging, and make-up. Study of representative one-act plays. Each student is required to produce a one-act play. A practical course for teachers.
31. *Survey of English Literature I.* Survey of English literature of the sixteenth, seventeenth, and eighteenth centuries.
32. *Survey of English Literature II.* Survey of English literature of the nineteenth century.
33. *Contemporary Literature.* Contemporary English and American writers.
34. *Books and Reading.* The selection of books and periodicals for the home library.

ROMANCE LANGUAGES

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

French

- 1-2. Beginning French.
- 3-4. Intermediate French.
- 20. Oral and Written French.
- 53. French Composition.
- 54-55. French Conversation.
- 70-71-72. Survey of French Literature.

Spanish

- 1-2. Beginning Spanish.
- 3-4. Intermediate Spanish.
- 20. Oral and Written Spanish.
- 53. Spanish Composition.
- 54-55. Spanish Conversation.
- 68-69. Survey of Spanish Literature.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

SOCIOLOGY AND SOCIAL WORK

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

- 1. Introduction to Sociology.
- 6. Social Interaction.
- 14. Rural Sociology
- 45. Social Statistics.
- 55. Housing Problems.
- 60. Child Welfare.
- 100. Social Psychology.
- 110. Rural Organization.
- 112. The Rural Social Survey.
- 114. Rural Social Institutions.
- 116. The Newspaper As a Social Institution.
- 119. The Family.
- 120. Social Progress.
- 134. Legal Protection of the Child.
- 135.¹ Rural Social Case Work.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

SOILS

- 6. Soils. Origin, formation, physical properties, moisture relations; principles of soil fertility, use of lime, commercial fertilizers, and stable manure; soil organisms and green manures; tillage.

¹ A fee of \$3.50 is charged for this course.

101. Chemical Analysis of Soils. A laboratory course in the chemical analysis of soils, including the determination of replaceable bases.
102. Special Problems in Soils. Individual laboratory or field work upon some special problem in soil physics or soil chemistry. Arrangements must be made in advance.
104. Soil Surveying. Principles of soil surveying with field practice in the preparation of soil maps.
107. Fertilizers. Development of the use of commercial fertilizers; their sources, preparation, composition, combination, and uses.
108. Physical Properties of Soils. The determination of physical constants of soils, including mechanical composition.

VETERINARY MEDICINE

- 2-3-4. Comparative Anatomy and Physiology of Domestic Animals. A course in anatomy and physiology with special reference to the structures involved in conformation, circulation, respiration, digestion, and excretion. Recitation and lectures.
6. Physiology of Reproduction. A study of embryology, obstetrics, sterility; the common diseases associated with breeding animals; non-infectious diseases associated with digestion.
- 9-10.¹ Veterinary Studies. Includes studies in anatomy, physiology, and the causes, prevention, and treatment of common diseases of domestic animals. Designed especially for students desiring a brief course in animal diseases.
12. Infectious Diseases. Etiology, morbid anatomy, symptomatology, diagnosis, prevention, and the basis of treatment of the common infectious diseases of animals. Special instruction will be given in preparation and use of vaccines, bacterins, serums, and antitoxins. Those who have completed Course 9-10 can obtain only half credit for this course.
- 101-102. Advanced Anatomy of Domestic Animals. Advanced study of the structures involved in the type, conformation, and nutrition of the common farm animals. Dissection of farm animals, including a study of the osseous, muscular, and other principal anatomical structures. Limited to nine students.
- 103-104. Advanced Comparative Physiology. An advanced course in physiology of the domestic animals, with laboratory work including digestion, circulation, respiratory, and genito-urinary systems.

ZOOLOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Courses in this department are closely correlated with those offered by the Division of Entomology and Economic Zoology of the College of Agriculture, Forestry, and Home Economics. For courses of that division, see page 62.

¹ Full credit will not be allowed for this course when other courses in this division are completed. Students pursuing other courses in veterinary medicine should apply to the division for adjustment of credit.

Credit is given for acceptable work done at any approved seaside laboratory.

- 14-15-16.¹ General Zoology. Structure, physiology, embryology, classification, and evolution of animals. Third quarter is devoted to the Arthropoda, principally the Insecta.
- 17-18.¹ General Zoology. A six-hour course for students in home economics.
- 21. Introductory Histology.
- 22.² Comparative Anatomy.
- 23. Introduction to General Physiology.
- 46-47. Ornithology.
- 51. Introductory Animal Parasitology.
- 52. Introductory Entomology.
- 53. General Ecology.
- 107. Protozoology.
- 117-118-119. Ecology of Insects.
- 125-126-127. Advanced Entomology.
- 144-145-146. Animal Parasites and Parasitism.
- 148-149-150. Histology and Organology.

For additional courses and course descriptions see the bulletin of the College of Science, Literature, and the Arts.

¹ A laboratory fee of \$1 per quarter is charged for this course.

² A fee of \$2 is charged for this course.

The Bulletin *of the University of* **Minnesota**

*The College of Agriculture, Forestry,
and Home Economics*

Part II

Announcement of Program for the Year
1932-1933



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1932							1933													
JULY							JANUARY							JULY						
Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa
..	..	..	..	..	1	2	1	2	3	4	5	6	7	..	..	..	..	..	..	1
3	4	5	6	7	8	9	8	9	10	11	12	13	14	2	3	4	5	6	7	8
10	11	12	13	14	15	16	15	16	17	18	19	20	21	9	10	11	12	13	14	15
17	18	19	20	21	22	23	22	23	24	25	26	27	28	16	17	18	19	20	21	22
24	25	26	27	28	29	30	29	30	31	..	..	..	..	23	24	25	26	27	28	29
31	..	..	..	..	..	..	..	..	..	..	..	..	..	30	31	..	..	..	..	..
AUGUST							FEBRUARY							AUGUST						
..	1	2	3	4	5	6	..	..	..	1	2	3	4	..	..	..	..	..	..	..
7	8	9	10	11	12	13	5	6	7	8	9	10	11	..	..	1	2	3	4	5
14	15	16	17	18	19	20	12	13	14	15	16	17	18	6	7	8	9	10	11	12
21	22	23	24	25	26	27	19	20	21	22	23	24	25	13	14	15	16	17	18	19
28	29	30	31	..	..	..	26	27	28	..	..	..	..	20	21	22	23	24	25	26
..	..	..	..	..	..	..	..	..	..	..	..	..	..	27	28	29	30	31	..	..
SEPTEMBER							MARCH							SEPTEMBER						
..	..	..	..	1	2	3	..	..	..	1	2	3	4	..	..	..	..	..	1	2
4	5	6	7	8	9	10	5	6	7	8	9	10	11	3	4	5	6	7	8	9
11	12	13	14	15	16	17	12	13	14	15	16	17	18	10	11	12	13	14	15	16
18	19	20	21	22	23	24	19	20	21	22	23	24	25	17	18	19	20	21	22	23
25	26	27	28	29	30	..	26	27	28	29	30	31	..	24	25	26	27	28	29	30
..
OCTOBER							APRIL							OCTOBER						
..	..	..	..	..	..	1	..	..	..	..	..	..	1	1	2	3	4	5	6	7
2	3	4	5	6	7	8	2	3	4	5	6	7	8	8	9	10	11	12	13	14
9	10	11	12	13	14	15	9	10	11	12	13	14	15	15	16	17	18	19	20	21
16	17	18	19	20	21	22	16	17	18	19	20	21	22	22	23	24	25	26	27	28
23	24	25	26	27	28	29	23	24	25	26	27	28	29	29	30	31	..	..	..	..
30	31	..	..	..	..	..	30	..	..	..	..	..	..	..	..	..	..	..	..	..
..
NOVEMBER							MAY							NOVEMBER						
..	..	1	2	3	4	5	..	1	2	3	4	5	6	..	..	..	1	2	3	4
6	7	8	9	10	11	12	7	8	9	10	11	12	13	5	6	7	8	9	10	11
13	14	15	16	17	18	19	14	15	16	17	18	19	20	12	13	14	15	16	17	18
20	21	22	23	24	25	26	21	22	23	24	25	26	27	19	20	21	22	23	24	25
27	28	29	30	..	..	..	28	29	30	31	..	..	..	26	27	28	29	30	..	..
..
DECEMBER							JUNE							DECEMBER						
..	..	..	..	1	2	3	..	..	..	..	1	2	3	..	..	..	..	..	1	2
4	5	6	7	8	9	10	4	5	6	7	8	9	10	3	4	5	6	7	8	9
11	12	13	14	15	16	17	11	12	13	14	15	16	17	10	11	12	13	14	15	16
18	19	20	21	22	23	24	18	19	20	21	22	23	24	17	18	19	20	21	22	23
25	26	27	28	29	30	31	25	26	27	28	29	30	..	24	25	26	27	28	29	30
..	..	..	..	..	..	..	..	..	..	..	..	..	..	31	..	..	..	..	..	..

UNIVERSITY CALENDAR

1932-33

Fall Quarter

1932			
September	22	Thursday	Payment of fees closes, except for new students
September	26	Monday	Entrance tests
September	26-27		Registration for Freshman Week for all new students entering the freshman class
September	26-30		Examinations for removal of conditions Physical examinations
September	27-28		College of Education qualifying examinations for new students entering the senior year
September	28-October 1		Freshman Week
September	29-30		Registration days ¹ for students with advanced standing and old students not previously registered
September	30	Friday	Payment of fees for new students closes
October	3	Monday	Fall quarter classes begin, 8:15 a.m. ²
October	3-8		First term School of Agriculture begins Advanced Creamery Operators' Short Course
October	20	Thursday	Senate meeting, 4:30 p.m.
October	29	Saturday	Homecoming Day
November	8	Tuesday	General Election Day; a holiday (except for extension)
November	9	Wednesday	Mid-quarter grades due
November	10-19		Ice Cream Makers' Short Course
November	11	Friday	Armistice Day Convocation
November	24	Thursday	Thanksgiving Day; a holiday
December	1	Thursday	State Day Convocation
December	15	Thursday	Senate meeting, 4:30 p.m.
December	17 & 19-23		Final examination period
December	22	Thursday	Commencement Convocation
December	23	Friday	Fall quarter ends, 5:20 p.m. First term School of Agriculture closes
December	31	Saturday	Payment of fees closes at 12 m. for all students in residence fall quarter ³

¹ Registration subsequent to the date specified will necessitate the approval of the college concerned. See also penalty fees for late registration, page 52, general information bulletin. No student will be allowed to register in the University after one week from the beginning of the quarter excepting in unusual cases wherein special circumstances shall justify the appropriate committee of the college concerned permitting registration at a later date.

² First hour classes begin at 8:30 a.m. on Minneapolis campus.

³ New students must pay fees on dates announced for registration.

4 AGRICULTURE, FORESTRY, AND HOME ECONOMICS

1933

Winter Quarter

January 5-February 16			Six weeks Creamery Short Course
January 6	Friday		Entrance tests
January 6-7			Registration days ¹ for new students
			Payment of fees for new students closes
			Registration and payment of fees close at 12 m. on January 7
January 9	Monday		Winter quarter classes begin, 8:15 a.m. ²
January 23-28			Second term School of Agriculture begins
			Farmers' and Homemakers' Week Short Course
February 14	Tuesday		Mid-quarter grades due
February 16	Thursday		Charter Day Convocation
			Senate meeting, 4:30 p.m.
February 22	Wednesday		Washington's Birthday; a holiday (except for extension)
March 20-25			Final examination period
March 23	Thursday		Commencement Convocation
			Payment of fees closes for all students ³ in residence winter quarter
March 25	Saturday		Winter quarter ends, 5:20 p.m.
			Second term School of Agriculture closes

Spring Quarter

March 31	Friday		Entrance tests
March 31 & April 1			Registration days ¹ for new students
			Payment of fees for new students closes
			Registration and payment of fees close at 12 m. on April 1
April 3	Monday		Spring quarter classes begin, 8:15 a.m. ²
April 14	Friday		Good Friday; a holiday (except for extension)
May 10	Wednesday		Mid-quarter grades due
May 11	Thursday		Cap and Gown Day Convocation
May 11-13			Editors' Short Course
May 18	Thursday		Senate meeting, 4:30 p.m.
May 30	Tuesday		Memorial Day; a holiday
June 10&13-17			Final examination period

¹ Registration subsequent to the date specified will necessitate the approval of the college concerned. See also penalty fees for late registration, page 52, general information bulletin. No student will be allowed to register in the University after one week from the beginning of the quarter excepting in unusual cases wherein special circumstances shall justify the appropriate committee of the college concerned permitting registration at a later date.

² First hour classes begin at 8:30 a.m. on Minneapolis campus.

³ New students must pay fees on dates announced for registration.

CALENDAR

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June	11	Sunday	Baccalaureate service
June	12	Monday	Sixty-first annual commencement
June	17	Saturday	Spring quarter closes, 5:20 p.m.

Summer Quarter

June	19-20		Registration, first term
June	21	Wednesday	Summer quarter classes begin, 8:00 a.m.
July	4	Tuesday	Independence Day; a holiday
July	24-29		Forestry, Woodcraft, Scouting, and Camping Leadership Short Course
July	27	Thursday	Commencement Convocation
July	29	Saturday	Registration and payment of fees for second term closes at 12 m.
			First term closes
July	31	Monday	Second term classes begin, 8:00 a.m.
September	2	Saturday	Second term closes

CURRICULA

Following is a summarized statement of the curriculum requirements for use in arranging registration. Detailed statements of the various curricula will be found in Part I of the bulletin.

A. TECHNICAL AGRICULTURAL CURRICULA

REQUIRED COURSES

Freshman year.—Freshman assembly; Mil. Sci. 1-2-3; Phys. Ed. 4; Agr. Eng. 5, 13, 28, 31, or 37; Agron. 1; An. Husb. 1-2; Bot. 1 and 6 credits from the following: Bot. 2, 5, 7, 12, 13, 21, 22; Dy. Husb. 1; Hort. 6 or 32; Inorg. Chem. 1-2-3 or 9-10; Math. 5 cred.; Rhet. 1, 2, 3.

Sophomore year.—Mil. Sci. 4-5-6; Agr. Biochem. 4 and 5 or 6; Agr. Econ. 1, 2; Agr. Eng. 3, 23; Bact. 41; Soils 6; Zool. 14-15-16.

Junior year.—Rhetoric 11 or 24 or 31, 22.

ELECTIVE COURSES

METHOD I—OPEN ELECTIVE CURRICULA

In addition to the required subject courses a major of 24 to 36 credits may be chosen from one of the following groups: (a) Farm Management and Agricultural Economics, (b) Agricultural Education, (c) Animal Industry, (d) Agricultural Sciences, and Plant Industry, (e) Agricultural Engineering; together with a minor of 18 credits from any group except that chosen for the major. Eighteen credit hours of the remaining electives must be chosen from groups other than major and minor.

METHOD II—SUGGESTED ELECTIVE CURRICULA

General Curriculum in Agriculture

Junior year.—Agr. Biochem. 6; Agr. Econ. 40; Agr. Eng. 12; Agron. 121, 123, 131, 132; An. Husb. 3-4, 6 or Dy. Husb. 103; Ent. 63; Hort. 6 or 32.

Senior year.—Agr. Econ. 102, 103, 141; Agr. Eng. 7; An. Husb. 112, 113; Dy. Husb. 7, 101; Pl. Path. 1; Sociol. 14; Vet. 9-10.

Agricultural Education

Junior year.—Agr. Educ. 11; Agr. Eng. 40; Agron. 121, 123, 131; An. Husb. 3-4, 8; Dy. Husb. 101; Ent. 63; Hort. 6; Vet. 9-10.

Senior year.—Agr. Econ. 40, 102, 103; Agr. Ed. 42, 181, 182, 183 and 3 additional credits; Dy. Husb. 7; Pl. Path. 1; Sociol. 14.

General Curriculum in Agricultural Economics

Arrange with adviser on major-minor plan.

General Curriculum in Agricultural Engineering

Junior year.—Agr. Econ. 40; Agr. Eng. 5, 7, 12, 13, 31, 37; Agron. 121, 122; An. Husb. 3-4, 8; Ent. 63; Pl. Path. 1.

Senior year.—Agr. Econ. 102, 103, 142; Agr. Eng. 14, 19, 24, 25; Agron. 131; An. Husb. 112; Dy. Husb. 7, 101; Sociol. 14.

General Curriculum in Animal Husbandry

Junior year.—Agr. Biochem. 6; Agron. 123, 131; An. Husb. 3-4, 5, 112; Vet. 2-3-4.

Senior year.—Agr. Econ. 40, 143; An. Husb. 6, 7, 101, 113, 115; Vet. 6.

General Curriculum in Dairy Husbandry

Junior year.—Agr. Biochem. 6; Agr. Econ. 101; Agron. 123, 131; An. Husb. 3-4;

Dy. Husb. 3, 7, 101, 104; Geol. 8; Soc. 1; Vet. 2-3-4.

Senior year.—Agr. Econ. 40, 102, 103, 104; Agr. Eng. 40; Agron. 121; An. Husb. 112, 113; Dy. Husb. 103, 105, 106; Ent. 63; Pl. Path. 1; Poult. 1.

General Curriculum in Dairy Products

Arrange with adviser on major-minor plan.

Curriculum in Fur Farming

Major and minor to be selected from the following:

Junior year.—Agr. Biochem. 6; Agr. Econ. 7; Agron. 131; Ent. 63, 64, 67; Vet. 2-3-4, 6, 12; Zool. 51.

Senior year.—Agr. Biochem. 116, 117; Agr. Econ. 101, 102; An. Husb. 112; Zool. 144-145-146.

General Curriculum in Horticulture

Junior year.—Agr. Econ. 40; Agron. 121, 131; Bot. 22; Ent. 63; Hort. 6, 32, 56, 72, 121; Pl. Path. 1, 112 or 113.

Senior year.—Agr. Econ. 102, 142; Agr. Eng. 12, or Agron. 132; Agr. Eng. 13 or 40; Hort. 93, 107, 110, 135, 137, 193-194; Sociol. 14.

Landscape Gardening

Junior year.—Agr. Eng. 19; Arch. 31-32-33; Ent. 63; Hort. 6, 32, 50, 56, 71, 72, 74, 93.

Senior year.—Agron. 131; Arch. 14-15-16; Hort. 76, 110, 191-192, 193-194-195; Pl. Path. 1, 112 or 114.

B. AGRICULTURAL SCIENCE

Freshman year.—Freshman assembly; Mil. Sci. 1-2-3; Phys. Ed. 4; Zool. 14-15-16 or Bot. 1 and 6 cred. from the following: Bot. 2, 5, 7, 12, 13, 21, 22; Inorg. Chem. 1-2-3 or 9-10; Math. 5, 6, 7, or modern language 15 cred.; Rhet. 1-2-3.

Sophomore year.—Mil. Sci. 4-5-6; Agr. Biochem. 4 and 5 or 6; Agr. Econ. 1, 2; Zool. 14-15-16 or Bot. 1 and 6 cred. from the following: Bot. 2, 5, 7, 12, 13, 21, 22; Bact. 41; Math. 5, 6, 7, or modern language 15 cred.; Rhet. 11 or 22; Soils 6.

Junior and senior years.—Major sequence 24-36 cred.; minor sequence 12 cred. Minimum of 21 credits elective in applied or technical agriculture or in sciences fundamental thereto.

C. AGRICULTURAL ENGINEERING

Professional Curriculum

Freshman year.—See bulletin of the College of Engineering and Architecture.

Sophomore year.—Mil. Sci. 4-5-6; Agr. Biochem. 4; Agr. Eng. 5, 7, 12, 13, 19-20, 43, 91, 92, 93; Hort. 6; M. & M. 24, 25, 84; Phys. 3, 4, 43, 44; Soils 6.

Junior year.—Agr. Eng. 14, 31, 37, 42, 71, 94, 95, 96; Agron. 1 or An. Husb. 15; C. E. 37; Econ. 8, 9, 28; M. & M. 86, 128, 143; M. E. 26, 27; Phys. 23, 24; Rhet. 22; Soils 108 or Agr. Eng. 72.

Senior year.—Agr. Eng. 70, 72 or Soils 108; Agr. Eng. 97, 98, 99, 150; Agr. Econ. 102, 103; Agron. 1 or An. Husb. 15; C. E. 51, 146; G. E. 101, 193; Geol. 5.

D. AGRICULTURAL BUSINESS ADMINISTRATION

Freshman year.—Same as for Agriculture except that Math. 5 or 8 is required.

Sophomore year.—Mil. Sci. 4-5-6; Agr. Econ. 1, 2, 8, 50; Econ. 20, 25-26; Psy. 1-2; Zool. 14-15-16.

Junior year.—Agr. Econ. 30, 40, 90, 110-111, 131, 141, 142; Bus. Adm. 51-52-53, 100, 142; Econ. 141.

Senior year.—Agr. Econ. 135, 150, 170, 191; Bus. Adm. 58, 71, 101-102, 139; Econ. 149.

E. AGRICULTURAL JOURNALISM

Freshman year.—Same as for Technical Agriculture curriculum substituting Engl. A-B-C for Rhet. 1-2-3.

Sophomore year.—Mil. Sci. 4-5-6; Agr. Econ. 1, 2, 8; Engl. 11-12; Jour. 13, 14-15; Psy. 1-2; Zool. 14-15-16.

Junior year.—Agr. Econ. 40, 90, 110-111; Jour. 51-52, 55, 69; Sociol. 1, 14.

Senior year.—Agr. Econ. 30, 135; Econ. 149; Jour. 60-61-62; Pub. and Rur. Jour. 10-11-12; Psy. 56.

FORESTRY

REQUIRED COURSES

Freshman year.—Freshman assembly; Mil. Sci. 1-2-3; Phys. Ed. 4; Agr. Eng. 3; Bot. 1, 21, 22; For. 1, 3-4; Inorg. Chem. 1-2-3 or 9-10; Math. 3, 4; Rhet. 1-2-3; (summer at Itasca Park).

Sophomore year.—Mil. Sci. 4-5-6; Agr. Biochem. 4, 5; For. 7-8; Geol. 1; Pl. Path. 10; Rhet. 11 or 22 or 31; Soils 6; Zool. 14-15.

Junior year.—Agr. Econ. 1-2; Agr. Eng. 24-25; Ent. 6; For. 33-34, 126.

Senior year.—For. 122-123, 134-135.

ELECTIVE COURSES

See elective groups in Part I of the bulletin.

HOME ECONOMICS

GROUP I—GENERAL REQUIREMENTS

Freshman year.—Freshman assembly; Phys. Ed. 1-2-3; Inorg. Chem. 1-2-3 or 9-10; H.E. 3,¹ 50-51, 70; Rhet. 1, 2, 3; Sociol. 1; Zool. 17-18.

Sophomore year.—Phys. Ed. 22; Agr. Biochem. 4; Agr. Eng. 23; Bact. 41; H.E. 15, 53, 80 or 81; Psy. 1-2; Rhet. 22.

Junior and senior years.—Agr. Econ. 3; H.E. 34, 35, 83, 85, 131, 170, 171; H.E. Ed. 40; Physiol. 4; Prev. Med. 52; Rhet. 11 or 24 or 31.

GROUP II—SPECIAL REQUIREMENTS

General Curriculum in Home Economics

Junior and senior years.—To those listed as required courses under Group I for freshman, sophomore, junior, and senior years add additional elective credits to total 193 quarter credit hours.

Curriculum in Foods and Nutrition

The same as those listed under Group I adding the following:

Junior and senior years.—Agr. Econ. 126, An. Husb. 111 or H.E. 75 and 179, 73, 173, 175, 182, 186 or 187.

¹ Transfer students presenting the equivalent of 3 credits in Textiles should register for H.E. 102 to complete textile requirement.

Curriculum in Textiles and Clothing

The same as those listed under Group I adding the following:

Junior and senior years.—Agr. Econ. 126; H.E. 11, 13, 16 or 17, 102, 115, and courses listed under Group A or B.

Curriculum for Dietitians

The same as those listed under Group I adding the following:

Junior and senior years.—Agr. Biochem. 2; Agr. Econ. 25; H.E. 60, 61, 63, 65, 71, 73, 75, 79, 163, 173, 175, 176 or 177, 178, 179, 182.

Curriculum in Institution Management

The same as those listed under Group I adding the following:

Junior and senior years.—Agr. Econ. 25, 126; An. Husb. 111; Econ. 1B, 161; H.E. 60, 61, 63, 65, 163, 182.

Teachers' Curriculum in Home Economics

Professional requirements: Ed. Psy. 55 or Agr. Ed. 11; Hist. of Ed. 1 or 5 or 101 or Ed. Ad. 65; H.E. Ed. 42,¹ 49 or 49a, 142a, 143.

Teachers' Curriculum in General Home Economics

To the professional requirements listed above and the courses listed under Group I add the following:

Junior and senior years.—Agr. Econ. 126; H.E. 11, 13, 16 or 17, 150.

Teachers' Curriculum in Home Economics Extension

To the professional requirements listed above and the courses listed under Group I add the following:

Junior and senior years.—Agr. Econ. 126; H.E. 11, 13, 16 or 17, 44, 150.

Teachers' Curriculum in Foods and Nutrition

To the professional requirements listed above and the courses listed under Group I add the following:

Junior and senior years.—Agr. Econ. 126; H.E. 73, 173 or 175 or 75 and 179, 182, 186 or 187.

Teachers' Curriculum in Textiles and Clothing

To the professional requirements listed above and the courses listed under Group I add the following:

Junior and senior years.—Agr. Econ. 126; H.E. 11, 13, 16 or 17, 102, 115, 150.

Teachers' Curriculum in Related Art

To the professional requirements listed above and the courses listed under Group I add the following:

Junior and senior years.—H.E. Ed. 147 instead of H.E. Ed. 142a and 143; Art Ed. 4-5-6, 7-8-9, 29-30-31; H.E. 11, 13, 55, 57, 150, 152, 154.

¹ Offered jointly with the College of Education and leads to qualification for state teacher's certificate.

TABULAR STATEMENT OF PROGRAM OF COURSES

CLASS HOUR SCHEDULE

	University Farm	Minneapolis Campus
I Hr	8:15- 9:05	8:30- 9:20
II Hr	9:15-10:05	9:30-10:20
III Hr	10:15-11:05	10:30-11:20
IV Hr	11:15-12:05	11:30-12:20
V Hr	12:15- 1:05	12:30- 1:20
VI Hr	1:30- 2:20	1:30- 2:20
VII Hr	2:30- 3:20	2:30- 3:20
VIII Hr	3:30- 4:20	3:30- 4:20
IX Hr	4:30- 5:20	4:30- 5:20

Convocation—Thursday, IV hour.

Freshman Assembly—Tuesdays, I hour (fall quarter).

CLASS SCHEDULE

Other schools and colleges.—For programs of classes given in other schools and colleges of the University, not listed below, send to the registrar, University of Minnesota, Minneapolis.

Abbreviations.—The following abbreviations are used to indicate names of buildings, those marked with an asterisk (*) are located on the Minneapolis campus; all others are on the University Farm.

A, *Armory	Hr, Horticulture
Ad, Administration	IA, *Institute of Anatomy
Ag, Agronomy	J, *Jones Hall
B, *School of Business Administration	Lib, *Library
BB, Beef Barn	MH, *Millard Hall
BCh, Biochemistry	MS, Meat Shop
Bo, *Botany	Mu, *Music
Bu, *Burton Hall	P, *Pillsbury Hall
C, *Chemistry	Ph, *Physics
CWI, *Child Welfare Institute	PP, Plant Pathology
Da, Old Dairy Hall	Psy, *Psychology
DH, Dining Hall	Pt, *Pattee Hall
E, *Main Engineering	S, *Stadium
Ed, *Education	So, Soils
En, Agricultural Engineering	St, Stock Pavilion
F, *Folwell Hall	Ve, Veterinary
G, *Greenhouse	WGm, *Women's Gymnasium
Gy, Gymnasium	WH, Women's Hall
HE, Home Economics	Z, *Zoology
HH, Haecker Hall	

Explanation of course numbers.—All undergraduate courses are numbered from 1 to 100. All courses open to undergraduates and graduates are numbered from 100 to 200. The letters f (fall), w (winter), and s (spring), indicate the quarters in which the course is offered. For example: 5f,w,s, indicates that Course 5 is a one-quarter course given in the fall and repeated in the winter and again in the spring; 10f-11w-12s indicates that Course 10-11-12 is a three-quarter course running through three quarters; 25f,w-26w,s indicates a two-quarter course given in the fall and winter quarters and repeated in the winter and spring quarter.

PROGRAM

1932-33

AGRICULTURAL BIOCHEMISTRY

No.	Title	Hour	Day	Bldg.	Instructor
2f,w	Quantitative Methods (5 cred.;* soph., jr., sr.; prereq., Inorg. Chem. 10 cred.)	VI, VII, VIII, IX	MWF	102, 108BCh	Mr. Rogers
4f	Introduction to Organic and Biochemistry (5 cred.;* soph., jr., sr.; prereq., Inorg. Chem. 10 cred.)	II	MTWThF	203HE	Mr. Bailey, Mr. Sandstrom
5s	Plant Biochemistry (5 cred.; soph., jr., sr.; prereq., 4 and Soils 6)	II	MTWThF	113BCh	Mr. Bailey, Mr. Gortner
6f	Animal Biochemistry (5 cred.; jr., sr.; prereq., 4 and Soils 6)	II	MTWThF	116BCh	Mr. Palmer
101f-102w	Agricultural Quantitative Analysis... (6 cred.; jr., sr.; prereq., 2)	VI, VII, VIII	MWF	208BCh	Mr. Bull
103s	Dairy Chemistry (5 cred.; jr., sr.; prereq., 2, 6)				
	Lect.	VI	MWF	116BCh	Mr. Palmer
	Lab.	VII, VIII, IX	MWF	208BCh	Mr. Palmer
108s	Chemistry of Wheat and Wheat Products (3 cred.; jr., sr.; prereq., 5)	I	MWF	211BCh	Mr. Bailey
110s	Flour Laboratory Methods (3-5 cred.; jr., sr.; prereq., 101-102 or equiv.)	VI, VII, VIII, IX	MWF	202BCh	Mr. Bailey
113f-114w-					
115s	Biochemical Laboratory Methods... (6 cred.; sr.; prereq., quant. anal., parallel 119-123)	VI, VII, VIII VII, VIII, IX	T Th	202, 208BCh	Mr. Sandstrom
116w	Advanced Animal Nutrition (3 cred.; jr., sr.; prereq., 6 or Physiologic Chem. 120 advised)	III	TThS	211BCh	Mr. Palmer, Miss Kennedy
117f,w,s	Laboratory Problems in Animal Nutrition (3 cred. jr., sr.; prereq., 116, instructor's permission)	Ar	Ar	314BCh	Mr. Palmer, Miss Kennedy
118f,w,s	Laboratory Problems in Biochemistry (3 or 5 cred.; sr.; prereq., 113-114, 119; or 103 or 110)	Ar	Ar	Ar	Ar
119f	Colloids (3 cred.; sr.; prereq., Zool. or Bot., 9 cred., and 5 or 6 or Org. Chem. 51-52-53)	III	MWF	113BCh	Mr. Gortner
120w	Proteins (3 cred.; sr.; prereq., 119)	II	MWF	113BCh	Mr. Gortner
121w	Carbohydrates (3 cred.; sr.; prereq., 119)	III	MWF	113BCh	Mr. Bailey

* Not open to students with credit in 7-8.

No.	Title	Hour	Day	Bldg.	Instructor
122s	The Lipids and Fats	III	TThS	113BCh	Mr. Bull
	(3 cred.; sr.; prereq., 119)				
123s	Enzymes	III	MWF	113BCh	Mr. Sandstrom
	(3 cred.; sr.; prereq., 119)				

AGRICULTURAL ECONOMICS

No.	Title	Hour	Day	Bldg.	Instructor
1f	Principles of Economics I (Agriculture)	I	MWF	302HH	Mr. Anderson
	(3 cred.; soph., jr., sr.; no prereq.)				
1w	Principles of Economics I.....				
	(Same as 1f)				
	Sec. 1 (Agriculture)	I	TThS	311HH	Mr. Anderson
	2 (Forestry)	III	TThS	302HH	Mr. Lowe
2w	Principles of Economics II (Agriculture)	I	MTWThF	302HH	Mr. Lowe
	(5 cred.; soph., jr., sr.; prereq., 1)				
2s	Principles of Economics II.....				
	(Same as 2w)				
	Sec. 1 (Agriculture)	I	MTWThF	302HH	Mr. Anderson
	2 (Forestry)	II	MTWThF	302HH	Mr. Lowe
3f	Principles of Economics (Home Economics)				
	(5 cred.; soph., jr., sr.; no prereq.)				
	Sec. 1	II	MTWThF	302HH	Mr. Lowe
	2	III	MTWThF	302HH	Mr. Lowe
3s	Principles of Economics (Home Economics)	III	MTWThF	311HH	Mr. Lowe
	(Same as 3f)				
7w	Natural Resources	III	MWF	312HH	Mr. Boss
	(3 cred.; soph., jr., sr.; no prereq.)				
8s	Rural Economics	III	TThS	302HH	Mr. Jesness
	(3 cred.; soph., jr., sr.; prereq., 2 or 3)				
25f,w	Principles of Accounting.....				
	(4 cred.; soph., jr., sr.)				
	Lect.	II(f)	MWF	311HH	Mr. Ulliyot
	Lab.	II(w)	TThS	311HH	
		VIII, IX	Th	311HH	
30f	Agricultural Prices	II	TThS	311HH	Mr. Garey
	(3 cred.; jr., sr.; prereq., 2)				
40f,s	Principles of Marketing Organization	I(f)	MWF	312HH	Mr. Cox
	(3 cred.; soph., jr., sr.; prereq., 2)	II(s)	MWF	312HH	Mr. Cox
47s	Marketing Accounting				
	(4 cred.; soph., jr., sr.; prereq., 25)				
	Lect.	IV	MWF	311HH	Mr. Ulliyot
	Lab.	VIII, IX	F	311HH	
50s	Farm Finance	IV	MTWFS	312HH	Mr. Johnson
	(5 cred.; soph., jr., sr.; prereq., 2)				
90f	Agricultural Statistics				
	(5 cred.; soph., jr., sr.)				
	Lect.	III	TThS	312HH	Mr. Cox
	Lab.	Ar	Ar		
101s	Farm Management	I	TThS	312HH	Mr. Pond
	(3 cred.; jr., sr.)				

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
102w	Farm Organization (3 cred.; jr., sr.; prereq., 2)				
	Lect.	II	TThS	312HH	Mr. Garey
103s	Farm Operation (3 cred.; sr.; prereq., 102)	II	TThS	312HH	Mr. Garey
104s	Types of Farming (3 cred.; sr.; prereq., 2)	III	MWF	312HH	Mr. Boss
110f-111w	Economics of Agricultural Production I and II (6 cred.; jr., sr.; prereq., 2)	I	TThS	312HH	Mr. Johnson
126f,s	Economics of Consumption (3 cred.; jr., sr.; prereq., 2 or 3)	I	TThS	311HH	Mr. Waite
131w	Market Prices (3 cred.; jr., sr.; prereq., 30, 40)	III	TThS	312HH	Mr. Waite
135s	Methods of Price Analysis (3 cred.; sr.; prereq., 30, 191)	III	TThS	312HH	Mr. Waite
140f	Marketing Organization: Staples (3 cred.; soph., jr., sr.; prereq., 40)	III	MWF	311HH	Mr. Johnson
141w	Marketing Organization: Dairy and Poultry Products (3 cred.; jr., sr.; prereq., 40)	II	MWF	312HH	Mr. Jesness
142s	Marketing Organization: Fruits and Vegetables (2 cred.; jr., sr.; prereq., 40)	III	MW	302HH	Mr. Cox
143w	Marketing Organization: Livestock and Meats (3 cred.; jr., sr.; prereq., 40)	III	MWF	302HH	Mr. Johnson
144f	Co-operative Organization (3 cred.; jr., sr.; prereq., 40)	II	TThS	312HH	Mr. Jesness
150s	Advanced Farm Finance (3 cred.; jr., sr.; prereq., 50 or equiv.)	VI, VII½	WF	302HH	Mr. Johnson
170s	Land Economics (3 cred.; jr., sr.; prereq., 110)	VII, VIII½	TTh	302HH	Mr. Johnson
191w	Advanced Agricultural Statistics (3 cred.; jr., sr.; prereq., 90)	IV	MWF	312HH	Mr. Waite

For additional courses see Economics and the bulletin of the School of Business Administration.

AGRICULTURAL EDUCATION

COLLEGE OF EDUCATION

No.	Title	Hour	Day	Bldg.	Instructor
11f,w,s	Educational Psychology (3 cred.; jr., sr.; no prereq.)	II	TThS	105Ad	Mr. Field
21f,s	Vocational Education (3 cred.; jr., sr.; no prereq.)	Ar	Ar	105Ad	Mr. Nylin
41†	Apprentice Teaching (2 cred.; jr., sr.; prereq., 11)	Not offered in 1932-33			
42f,w,s†	Supervised Teaching Experience (3 cred.; sr.; prereq., 181)	Ar	Ar	Ar	Mr. Field, Mr. Nylin
64w,s	Survey of Agriculture (3 cred.; no prereq.)	Ar	Ar	Ar	Mr. Field and others
75	Visual Presentation (3 cred.; jr., sr.; prereq., 11)	Not offered in 1932-33			

† A special fee of \$1 per credit hour is charged for this course.

No.	Title	Hour	Day	Bldg.	Instructor
81s	Extension Work (3 cred.; jr., sr.; prereq., 6 cred. in farm mgt., 6 cred. in farm crops, 15 cred. in an. ind., 6 cred. in agr. ed.)	VI	MWF	105Ad	Mr. Storm
82f,w,s	Agricultural Extension Field Course.. (3 to 10 cred.; jr., sr.; prereq., 81)	Ar	Ar	Ar	Mr. Storm, Mr. Field
135	The Curriculum in Vocational Agriculture	Ar	Ar	Ar	
	(3 cred.; sr.; prereq., 11)				
141w,s	Supervised Practice in Vocational Agriculture	Ar	Ar	Ar	Mr. Field
	(3 cred.; sr.; prereq., 11)				
144w	Course Organization and Instruction for the Individual in Vocational Agriculture	Ar	Ar	Ar	Mr. Field
	(2 cred.; sr.; prereq., 11)				
154f,w	Rural Education and Community Leadership	IV 1 hour	TS Ar	105Ad Ar	Mr. Field
	(3 cred.; sr.; prereq., 11)				
161f,w,s	Vocational Education in Agriculture (3 cred.; jr., sr.; prereq., 11, 181, 182, 183)	Ar	Ar	Ar	Ar
162f,w,s	The Basis of Vocational Teaching Technique	Ar	Ar	Ar	Ar
	(3 cred.; jr., sr.; prereq., 11, 181, 182, 183)				
164f,w,s	Fundamentals of Agriculture..... (3 cred.; jr., sr.; prereq., 11 or Ed. Psy. 55)	Ar	Ar	Ar	Ar
171w,s	Problems in Procedure..... (3 cred.; sr.; prereq., 42 or equiv. teaching experience)	Ar	Ar	Ar	Mr. Field
176s	Problems in Visual Presentation..... (3 cred.; jr., sr.; prereq., 75)	Ar	Ar	Ar	Mr. Field
181f	Teaching Agriculture	III	MTWThS	105Ad	Mr. Storm, Mr. Field
	(5 cred.; jr., sr.; prereq., 11)				
182w	Teaching Agriculture	III	MTWThF	105Ad	Mr. Storm, Mr. Field
	(Same as 181f)				
183s	Teaching Agriculture	III	MTWThF	105Ad	Mr. Storm, Mr. Field
	(Same as 181f)				
191f-192w-193s	Seminar in Agricultural Education... (6 cred.; sr.; prereq., 11 cred.)	Ar	Ar	Ar	Mr. Storm, Mr. Field

AGRICULTURAL ENGINEERING

No.	Title	Hour	Day	Bldg.	Instructor
3f,s	Mechanical Drawing	III, IV	MWF	303En	Mr. Neubauer
	(2 cred.; no prereq.)				
5w	Farm Building Design and Construction				
	(3 cred.; no prereq.)				
	Lect.	II	M	41En	Mr. White
	Lab.	II, III	WF	48En	Mr. Berggren

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
7s	Farm Structures I..... (3 cred.; prereq., 3, 5)				
	Lect.	I	T	305En	Mr. White
	Lab.	I, II	ThF	305En	Mr. White
11w	Applied Mathematics (5 cred.; no prereq.)	III	MTWFS	103En	Mr. Neal
12s	Field Machinery (3 cred.; jr., sr.; no prereq.)				
	Lect.	I	MW	216En	Mr. Schwantes
	Sec. 1 Lab.	VI, VII, VIII	T		
	2	II, III, IV	T		
13f,s	Gas Engines (3 cred.; no prereq.)	VI, VII, VIII(f)	MW	216,37En	Mr. Torrance
	Lab.	VI, VII, VIII(s)	TTh		
14f,s	Tractors (3 cred.; prereq., 13)				
	Lect.	II(f)	TTh	216En	Mr. Torrance
	Lab.	VI, VII, VIII, IX	F	37En	
		VI, VII, VIII(s)	WF	216,37En	
15f	Ignition and Carburetion..... (3 cred.; prereq., 13)				
	Lect.	III	MW	216En	Mr. Torrance
	Lab.	III, IV	F		
19f	Elementary Surveying (3 cred.; prereq., 3, 11 or trigonometry, or Draw. 3 and M.&M. 12)				
	Lect.	III	T	106En	Mr. Neal
	Lab.	VI, VII, VIII	WF or TTh	305En	Mr. Howe
20s	Advanced Surveying (3 cred.; prereq., 19)				
	Lect.	VI	M	105En	Mr. Neal,
	Lab.	VII, VIII, IX	MF	305En	Mr. Howe
23f	General Physics (5 cred.; no prereq.)				
	Lect.	III	TThS	101En	Mr. Romness
	Sec. 1 Lab.	I, II	ThS	102En	Mr. Romness
	2	VI, VII	TTh	102En	Mr. Tyler
23s	General Physics (Same as 23f)				
	Sec. 1 Lect.	III	TThS	101En	Mr. Romness
	2	IV	MWF	101En	Mr. Romness
	Sec. 1 Lab.	I, II	WF	102En	Mr. Romness
	2	I, II	TS	102En	Mr. Romness
	3	VI, VII	TTh	102En	Mr. Tyler
	4	VI, VII, VIII, IX	M	102En	Mr. Tyler
	5	VI, VII, VIII, IX	W	102En	Mr. Tyler
	6	III, IV	MW	102En	Mr. Tyler
	7	III, IV	TS	102En	Mr. Tyler
24f	Agricultural Physics I (4 cred.; prereq., Math. 4 or equiv.)				
	Lect.	III	MWF	101En	Mr. Romness
	Lab.	VI, VII, VIII	M or F	102En	
25w	Agricultural Physics II (4 cred.; prereq., 24)				
	Lect.	I	TThS	101En	Mr. Romness
	Lab.	VI, VII, VIII	M or W	102En	

No.	Title	Hour	Day	Bldg.	Instructor
28w	Land Clearing	I	TThS	103En	Mr. Schoenleber
	(3 cred.; jr., sr.; no prereq.)				
31w,s	Principles of Drainage	III	TThS	105En	Mr. Roe, Mr. Neal
	(3 cred.; no prereq.)				
34w	Household Mechanics	I, II	MWF	103En	Mr. Romness
	(3 cred.; prereq., 23 or equiv.)				
35s	Household Physics	I, II	MWF	101,103En	Mr. Romness
	(3 cred.; prereq., 23 or equiv.)				
37f,w	Rural Sanitation	I(f)	TThS	101En	Mr. Tyler
	(3 cred.; no prereq.)	I(w)	MWF	101En	Mr. Tyler
40f,s	Mechanical Training I	I, II	MWF	20,106En	Mr. Dent
	(3 cred.; no prereq.)				
41w	Mechanical Training II.....	I, II	MWF	20,106En	Mr. Dent, Mr. Bergren
	(3 cred.; no prereq.)				
42s	Principles of Irrigation	II	TThS	105En	Mr. Roe
	(3 cred.; no prereq.)				
43f	Mechanical Laboratory	I, II, III	ThS	20,106En	Mr. Dent
	(3 cred.; no prereq.; for prof. agr. eng. only)				
67s	Farm Structures II	Ar	Ar	305En	Mr. White
	(3 cred.; jr., sr.; prereq., 7, M.&M. 128)				
68f	Drainage Engineering and Works....	I	M	105En	Mr. Roe
	(3 cred.; prereq., 31, M.&M. 86)	II, III, IV	MF		
69s	Irrigation Engineering and Works...	I	M	105En	Mr. Roe
	(3 cred.; prereq., 42, M.&M. 86)	II, III, IV	MW		
70w	Steam Boilers and Engines.....	II	TThS	216En	Mr. Boss
	(3 cred.; prereq., Phys. 23, 24)				
71f	Power Machinery				
	(3 cred.; prereq., 12, 13)				
	Lect.	VI	MW	106En	Mr. Schwantes
	Lab.	VII, VIII, IX	W	49En	
72w	Applied Electricity				
	(3 cred.; prereq., 25)				
	Lect.	VI	T	101En	Mr. Romness
	Lab.	VII, VIII, IX	T		
		VI, VII, VIII	Th		
91f,92w,93s	Agendum	IX(f)	3d T ea. mo.		Mr. Boss
	(No cred.; soph. in prof. agr. eng. only)	IX(w)	3d F ea. mo.		Mr. Boss
		IX(s)	3d Th ea. mo.		Mr. Boss
94f,95w,96s	Agendum	IX(f)	3d T ea. mo.		Mr. Boss
	(No cred.; jr. in prof. agr. eng. only)	IX(w)	3d F ea. mo.		Mr. Boss
		IX(s)	3d Th ea. mo.		Mr. Boss
97f,98w,99s	Agendum	IX(f)	3d T ea. mo.		Mr. Boss
	(No cred.; sr. in prof. agr. eng. only)	IX(w)	3d F ea. mo.		Mr. Boss
		IX(s)	3d Th ea. mo.		Mr. Boss
101f-102w-103s	Advanced Drainage Problems.....	Ar	Ar	Ar	Mr. Roe, Mr. Neal
	(3 to 6 cred. per quarter; sr.; prereq., 68)				
111f-112w-113s	Farm Building Problems	Ar	Ar	305En	Mr. White
	(3 to 6 cred. per quarter; sr.; prereq., 67)				
121f-122w-123s	Farm Power and Machinery Problems	Ar	Ar	Ar	Mr. Schwantes
	(3 to 6 cred. per quarter; prereq., 126)				

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
126s	Selection of Farm Equipment..... (3 cred.; prereq., 14, 71, Agr. Econ. 103, M.E. 27)				
	Lect.	III	MW	106En	Mr. Schwantes
	Lab.	III, IV	F	49En	
141w	Land Clearing II	Ar	Ar	Ar	Mr. Thompson
	(3 cred.; prereq., 28)				

AGRONOMY AND PLANT GENETICS

No.	Title	Hour	Day	Bldg.	Instructor
1f,s	General Farm Crops	III, IV	MWF	100Ad	Mr. Johnson
	(3 cred.; no prereq.)				
121f	Grain Crops	VI, VII, VIII	TTh	100Ad	Mr. Wilson
	(3 cred.; soph., jr., sr.; prereq., 1, Bot. 10 cred.)				
122w	Grain and Hay Grading.....	VI, VII, VIII	TTh	100Ad	Mr. Wilson
	(3 cred.; soph., jr., sr.; prereq., 1, Bot. 10 cred.)				
123s	Forage Crops	VI, VII, VIII	TTh	100Ad	Mr. Arny
	(3 cred.; soph., jr., sr.; prereq., 1, Bot. 10 cred.)				
124s	Problems in Farm Crops.....	Ar	Ar	Ar	Mr. Wilson
	(3 cred.; jr., sr.; prereq., 1)				
126f	Advanced Crop Judging	Ar	Ar	100Ad	Mr. Wilson
	(3 cred.; jr., sr.; prereq., 122)				
131f,w	Principles of Genetics.....				
	(3 cred.; soph., jr., sr.; prereq., Bot. or Zool. 9 cred.)				
	Lect.	I	ThS	102Ad	Mr. Powers
	Lab.	I(s)	T	102Ad	Mr. Powers
132w	Farm Crops Plant Breeding.....	VI, VII, VIII	TTh	102Ad	Mr. Powers
	(3 cred.; jr., sr.; prereq., 131)				
134f,w	Laboratory Problems in Genetics.....	Ar	Ar	303Ag	Mr. Doxtator
	(3 cred.; jr., sr.; prereq., 131 or parallel)				

ANIMAL HUSBANDRY

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w	Types and Market Classes of Live- stock	I, II	MWF	CSt	Mr. Harvey
	(6 cred.; no prereq.)				
1w-2s	Types and Market Classes of Live- stock	I, II	TThS	3St(w) CSt(s)	Mr. Harvey
	(Same as 1f-2w)				
3f-4w	Types and Breeds of Livestock.....	I, II	MWF	WSt	Mr. Winters
	(6 cred.; soph., jr., sr.; prereq., 1-2)				
5s	Livestock Judging	III, IV	MWF	CSt	Mr. Harvey
	(3 cred.; soph., jr., sr.; prereq., 3-4)				
6w	Livestock Feeding	III	MTWFS	3St	Mr. Ferrin
	(5 cred.; jr., sr.; prereq., Agr. Bio- chem. 6)				
7f	Meats	VI, VII, VIII	TTh	MS	Mr. Anderson
	(3 cred.; jr., sr.; prereq., 3-4)				

No.	Title	Hour	Day	Bldg.	Instructor
8s	Fundamentals of Feeding and Management (5 cred.; jr., sr.; no prereq.)	I	MTWThF	3St	Mr. Ferrin
12s	Meat Selection and Utilization (3 cred.; jr., sr.; no prereq.)	VI, VII, VIII	TTh	MS	Mr. Anderson
15s	Fundamentals of Livestock Production (3 cred.; jr., sr., in prof. agr. eng. only; no prereq.)	I	TThS	WSt	Mr. Peters
101f	Advanced Stock Judging (3 cred.; jr., sr.; prereq., 5)	VI, VII	MWF	CSt	Mr. Harvey
106w	Advanced Meats (3 cred.; jr., sr.; prereq., 7)	VI, VII, VIII	WF	MS	Mr. Anderson
107s	Meat Problems (3 cred.; jr., sr.; prereq., 106)				
	Lect.	IV	TS	MS	Mr. Anderson
	Lab.	VI, VII, VIII	F	MS	
108f, 109w, 110s	Seminar (3 cred.; jr., sr.; prereq., 3-4)	IX	T	3St	Mr. Peters
111w	Utilization of Meats (3 cred.; Home Econ. students; no prereq.)	III III, IV	ThS T	MS	Mr. Anderson
112w	Animal Breeding (3 cred.; jr., sr.; prereq., Agron. 131)	IV	MWF	3St	Mr. Winters
113s	Livestock Management (3 cred.; jr., sr.; prereq., 6, 112)	VI, VII	MW	3St	Mr. Peters
114s	Advanced Study of the Breeds of Livestock (3 cred.; jr., sr.; prereq., 3-4)	II	TThS	3St	Mr. Winters
115f	The Marketing of Livestock (3 cred.; jr., sr.; prereq., 3-4)	II	TThS	3St	Mr. Peters
116f	Embryology of Farm Animals (3 cred.; jr., sr.; prereq., 112, Vet. Med. 2-3-4 or equiv.)	VI, VII, VIII	TTh	3St	Mr. Winters

ARCHITECTURE

COLLEGE OF ENGINEERING AND ARCHITECTURE

No.	Title	Hour	Day	Bldg.	Instructor
21f*	Freehand Drawing (2 cred. per qtr.; no prereq.)				
	Sec. 1	VII-IX	TTh	417E	Mr. Doseff
	2	II-IV	MF	417E	Mr. Young
	3	VI-VIII	MW	417E	Mr. Doseff
	4	II-IV	TS	405E	Mr. Doseff
21w*	Freehand Drawing (See 21f) (Limited registration)	VII-IX VI-VIII	T Th	417E	Mr. Doseff
22w*	Freehand Drawing (2 cred.; prereq., 21)				
	Sec. 1	VI-VIII	TTh	417E	Mr. Doseff
	2	II-IV	WF	417E	Mr. Doseff
	3	VI-VIII	MW	417E	Mr. Young
22s*	Freehand Drawing (See 22w) (Limited registration)	VII-IX VII-VIII	WTh F	417E	Mr. Doseff

* Offered on the Minneapolis campus.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
23s*	Freehand Drawing				
	(2 cred.; prereq., 22)				
	Sec. 1	VII-IX	TF	417E	Mr. Doseff
	2	II-IV	WF		
	3	VI-VIII	MW	417E	Mr. Doseff
		II-III	T		

For additional courses see the bulletin of the College of Engineering and Architecture.

ART EDUCATION

COLLEGE OF EDUCATION

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w-3s*†	Fundamental Principles of Design...				
	(9 cred.; no prereq.)				
	Sec. 1 Lect.	II	TThS	207BJ	Miss Lutz
	Lab.	III	TThS	207BJ	Miss Lutz
	2 Lect.	III	TThS	207AJ	Miss Lutz
4,5,6f,w,s*	Still Life				
	(3 cred.; no prereq.)				
	Sec. 1	I, II	M	203J	Mr. Harmes
	2	I, II	W	203AJ	Mr. Harmes
	3	II, III	W	203AJ	Mr. Harmes
7,8,9f,w,s*	Sketch				
	(3 cred.; no prereq.)				
	Sec. 1	III, IV	M	203AJ	Mr. Harmes
	2	I, II	F	203J	Miss Lutz
	3	III, IV	F	203J	Miss Lutz
10f-11w-12s*	Graphic Composition				
	(3 cred.; no prereq.)				
		II, III	M	203AJ	Miss Raymond
20f-21w-22s*	Principles of Harmony in Form and Color				
	(9 cred.; soph., jr., sr.; prereq., 1-2-3 or instructor's permission)				
	Lect.	II	MWF	207J	Mr. Hilpert
29,30,31, f,w,s*	Sketch, Course II.....	I, II	S	203AJ	Miss Raymond
	(3 cred.; soph., jr., sr.; prereq., 7, 8, 9)				

For additional courses see the bulletin of the College of Education.

BACTERIOLOGY AND IMMUNOLOGY

MEDICAL SCHOOL

No.	Title	Hour	Day	Bldg.	Instructor
41f,w,s*†	General Bacteriology	VII, VIII, IX	MWF	Ar	Dr. Halvorson
	(5 cred.; soph., jr., sr.; prereq., chem. and biol.)				
103w*	Soil Microbiology	I, II, III	TS	MH	Dr. Skinner
	(5 cred.; jr., sr.; prereq., 41)	I, II	Th	MH	

* Offered on the Minneapolis campus.

† Home Economics students with credit in H.E. 51 and 53 will be admitted to the last quarter of the course.

‡ A fee of \$1.50 is charged for this course.

No.	Title	Hour	Day	Bldg.	Instructor
121w*	Industrial Bacteriology (3 cred.; jr., sr.; prereq., 41)	I, II	TTh	Ar	Ar
122s*	Industrial Bacteriology (cont'd) (Same as 121)	I, II	TTh	MH	Ar

For additional courses see the bulletin of the Medical School.

BEEKEEPING

See Entomology and Economic Zoology.

BOTANY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

No.	Title	Hour	Day	Bldg.	Instructor
1f*	General Botany (4 cred.; students in Agr. and For.)				
	Lect.	VI	TTh	BoAud	Mr. Huff
		VII	Th		
	Sec. 1 Quiz	VII	T	1,4,5,8Bo	
	2	V	T		
1w,s*	General Botany (4 cred.; students in H.E.; no pre-req.)				
	Lect.	III	TThS	BoAud	Mr. Huff
	Sec. 1 Quiz	I	T		
	2	II	T		
	3	III	M		
	4	IV	M		
2w,s*	Elementary General Morphology of Plants (3 cred.; all; prereq., 1)				
	Lect.	III, IV	M	BoAud	Mr. Huff
	Sec. 1 Lab.	III, IV	TS	1,4,5,8Bo	
	2	III, IV	WF	1,4,5,8Bo	
3su	Forest Botany (1 cred.; no prereq.)	Given at Itasca Park			Mr. Rosendahl
5w*	Elementary Plant Histology (3 cred.; all; prereq., 1)	VI, VII, VIII	WF	1,4,5,8Bo	Mr. Butters
7f*	Taxonomy of Flowering Plants (3 cred.; all; prereq., 1)	I, II	MWF	1,4,5,8Bo	Mr. Rosendahl
7s*	Taxonomy of Flowering Plants (Same as 7f)				
	Sec. 1	I, II	MWF	1,4,5,8Bo	Mr. Rosendahl
	2	VI, VII, VIII	TTh	1,4,5,8Bo	
12f,w,s*	Morphology of Algae (3 cred.; all; prereq., 1)	I, II	TThS	1,4,5,8Bo	Miss Tilden
21f*	Elementary Ecology (3 cred.; all; prereq., 1)	III, IV	MWF	1,4,5,8Bo	Mr. Cooper
21w,s*	Elementary Ecology (Same as 21f)	VI, VII, VIII	TTh	1,4,5,8Bo	Mr. Cooper
22f,w,s*	Elementary Plant Physiology (3 cred.; all; prereq., 1)				
	Lect.	VI	TTh	1,4,5,8Bo	Mr. Burr
	Lab.	VII, VIII	TTh		

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

* Offered on the Minneapolis campus.

CHILD WELFARE INSTITUTE

No.	Title	Hour	Day	Bldg.	Instructor
40w*	Child Training (See also H.E.Ed.40) (3 cred.; jr., sr.; prereq., Psy. 1-2)	IV 1 hr ar	MW	202Pt	Mrs. Foster
60f*	Modern Aspects of Child Study..... (2 cred.; jr., sr.; prereq., 6 cred. in psy. or ed.)	VI	TTh	202Pt	Miss McGinnis
80f*	Child Psychology (3 cred.; jr., sr.; prereq., Psy. 1-2)	II	MWF	202Pt	Mr. Anderson
90w*	Physical Development of the Young Child (2 cred.; jr., sr.; prereq., Psy. 1-2, Zool. 1-2-3)	V	T and ar	202Pt	Dr. Boyd
120s*	Health Care of Young Child..... (2 cred.; sr.; prereq., 50-51 and permission of instructor)	V	T and ar	202Pt	Dr. Boyd
130s*	The Development of the Young Child (3 cred.; sr.; grad.; prereq., 15 cred. in psy. or equiv. and permission of instructor)	I	MWF	202Pt	Mr. Anderson
133f-134w-135s*	Observation and Experimental Methods in Study of Young Child..... (6 or 9 cred.; sr.; prereq., 10 cred. in psy. or ed. psy., incl. 1 lab. course, or equiv., permission of instructor)	VI VI, VII	M WF	202Pt	Miss Good-enough
170f*	Parental Education in Child Care and Training (3 cred.; sr., grad.; prereq., 52-53-54 or H.E. 34, 35, and 44, or 15 cred. in ed. or psy., or sociol. or prev. med.)	III	MWF	202Pt	Miss McGinnis
173w-174s*	Technique and Practice of Parental Education (6 cred.; sr., grad.; prereq., 170 and permission of instructor)	Ar	Ar	204Pt	Miss McGinnis
190w-191s*	Mental Examination of Pre-school Children (2 or 4 cred.; sr., grad.; prereq., Ed. Psy. 143-144-145 or 134-135-136 or equiv. and permission of instructor)	III	TTh	202Pt	Miss Good-enough

DAIRY HUSBANDRY

No.	Title	Hour	Day	Bldg.	Instructor
1f,s	Elements of Dairying (5 cred.; prereq., entrance credit in chemistry or Inorg. Chem. 1 or 9) (Limited to 35)				
	Lect.	III(f) III(s)	TWS TThS	100HH	Mr. Combs
	Lab.	III, IV VI, VII, VIII	MF MWF		Mr. Coulter Mr. Macy
2w	Dairy Bacteriology (5 cred.; soph., jr., sr.; prereq., Bact. 41)			210HH	

* Offered on the Minneapolis campus.

AGRICULTURE, FORESTRY, AND HOME ECONOMICS

No.	Title	Hour	Day	Bldg.	Instructor
3w	Dairy Bacteriology (3 cred.; soph., jr., sr.; prereq., Bact. 41)	VI	MWF	210HH	Mr. Macy
4s	Dairy Products Practice (3 cred.; soph., jr., sr.; prereq., 1)	Ar	Ar	Ar	Mr. Combs
7f	Dairy Stock Selection (2 cred.; jr., sr.; prereq., 101 or parallel)	VI, VII, VIII	TTh	210HH	Mr. Petersen
101f	Milk Production (5 cred.; jr., sr.; prereq., 1)	IV	MTWFS	210HH	Mr. Eckles
102s	Market Milk (3 cred.; jr., sr.; prereq., 1, 2 or 3)	IV	MW Th	210HH	Mr. Macy
103w	Dairy Stock Feeding (3† cred.; sr.; prereq., 101, Agr. Bio-chem. 6)	III	MWF	210HH	Mr. Eckles
104s	Dairy Cattle Breeding (3 cred.; jr., sr.; prereq., 7, 101, Agron. 131)	VI, VII, VIII	MW	210HH	Mr. Petersen, Mr. Allen
105f	Seminar I (1 cred.; sr.; prereq., 3 courses in dy. husb.)	II	S	214HH	Mr. Eckles
106w	Seminar II (1 cred.; sr.; prereq., 105)	II	S	214HH	Mr. Eckles
110w	Dairy Products III (3 cred.; jr., sr.; prereq., 1)	IV	TS T	210HH	Mr. Combs
111f	Dairy Products I (3 cred.; jr., sr.; prereq., 1, 2 or 3)	VI	MW F	100HH	Mr. Combs
112s	Dairy Products II (3 cred.; jr., sr.; prereq., 1, 2 or 3)	IV	TS	210HH	Mr. Combs, Mr. Baldwin
		VI, VII, VIII	T	210HH	Mr. Combs, Mr. Coulter
113s	Technical Control (3 cred.; sr.; prereq., 2, 111 or 112)	I, II, III	TTh	210HH	Mr. Combs, Mr. Coulter
115s	Advanced Dairy Bacteriology (3 cred.; sr.; prereq., 2, 111 or 112)	Ar	Ar	Ar	Mr. Macy

EDUCATIONAL ADMINISTRATION AND SUPERVISION

COLLEGE OF EDUCATION

No.	Title	Hour	Day	Bldg.	Instructor
119f*	The Elementary School Curriculum... (3 cred.; sr.; prereq., 10 cred. in educ. incl. Ed. Psy. 55 or 56)	III, IV	S	PtAud	Mr. Peik
119T-120T*	The Elementary School Curriculum... (Same as 119f)	Not offered in 1932-33			

For additional course see the bulletin of the College of Education.

* Offered on the Minneapolis campus.

† Only two credits allowed those who have completed An. Husb. 8.

PROGRAM

EDUCATIONAL PSYCHOLOGY

COLLEGE OF EDUCATION

No.	Title	Hour	Day	Bldg.	Instructor
55f,w,s*	Educational Psychology (3 cred.; jr., sr.; prereq., Psy. 6 cred.)	I	MWF	210Bu(f) 115Psy(w) Ar(s)	Mr. Miller
111s*	Educational Measurements in the Elementary School (3 cred.; jr., sr.; prereq., 55 or equiv.)	II	MWF	109Psy	Mr. Van Wag- enen

For additional courses see the bulletin of the College of Education.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

No.	Title	Hour	Day	Bldg.	Instructor
6w	Forest Entomology (4 cred.; jr., sr.; prereq., Zool. 16 or equiv.)	VI, VII, VIII	TTh	307Ad	Mr. Orr
7w	Vertebrate Taxonomy (3 cred.; prereq., Zool. 9 cred.)	VI, VII, VIII VII, VIII	M MW	16Ad	Mr. King
9f,w,s	Elementary Bee Science (3 cred.; all; no prereq.)	IV	MWF	307Ad	Mr. Tanquary
10f,w	Industrial Beekeeping (3 cred.; all; no prereq.)	III 2 hrs ar	TTh	307Ad	Mr. Tanquary
11w,s	Advanced Beekeeping I (3 cred.; all; prereq., 9 or 10)	Ar	Ar	Ar	Mr. Tanquary
12s	Advanced Beekeeping II (3 cred.; all; prereq., 11)	Ar	Ar	Ar	Mr. Tanquary
13su	Field Zoology (1 cred.; no prereq.)	Given at Itasca Park			Mr. Dawson
51f*	Introductory Parasitology (5 cred.; soph., jr., sr.; prereq., Zool. 14-15 or equiv.)	VI, VII, VIII	MWF	208Z	Mr. Riley
52w*	Introductory Entomology (5 cred.; soph., jr., sr.; prereq., Zool. 14-15 or equiv.)				
	Lect.	VI	MWF	211Z	Mr. Mickel
	Sec. 1 Lab.	VI, VII, VIII	TTh	401Z	
	2	VII, VIII	MWF	401Z	
63f,w	Economic Entomology (3 cred.; jr., sr.; prereq., Zool. 16 or equiv.)	VI, VII	MWF	302Ad	Mr. Ruggles
64w	Economic Vertebrate Zoology (3 cred.; jr., sr.; prereq., Zool. 14-15 or equiv.)	I	MWF	301Ad	
65f,w	Economic Entomology (5 cred.; jr., sr.; prereq., Zool. 16 or equiv.)	VI, VII, VIII	MWF	302Ad	Mr. Ruggles
67	Varieties and Habits of Fur Bearing Animals	Not offered in 1932-33			
68f	Methods in Field Zoology (3 cred.; jr., sr.; prereq., 7)	VI, VII, VIII	TTh	307Ad	Mr. King
117f-118w- 119s*	General Ecology of Insects..... (9 cred.; jr., sr.; prereq., 15 cred. Zool. or Ent.)	VI, VII, VIII	TTh	401Z	Mr. Eddy, Mr. Hodson

* Offered on the Minneapolis campus.

No.	Title	Hour	Day	Bldg.	Instructor
125f-126w- 127s*	Advanced General Entomology..... (9 cred.; jr., sr.; prereq., 15 cred. Zool. or Ent.)				
	Lect.	III, IV	T	208Z	Mr. Mickel
	Lab.	I, II, III	S	401Z	
139f-140w*	Histology and Development of Insects (9 cred.; jr., sr.; prereq., 125-126-127 or equiv.)	Ar	Ar	Ar	Mr. Riley
141f-142w	Insects in Relation to Plant Diseases... (6 cred.; prereq., 8 cred. Ent. or Plant Path.)	III, IV	TThS	302Ad	Mr. Granovsky, Mr. Leach
144f,s-145w- 146s*	Animal Parasites and Parasitism..... (3 to 9 cred.; jr., sr.; prereq., Zool. 9 cred.)	VI, VII, VIII	WF	208Z	Mr. Riley
175f	Insecticides and Their Action..... (4 cred.; sr.; prereq., inorg. and org. chem.)	I Lab hrs. ar	MWF	302Ad	Mr. Shepard
176w-177s	Advanced Economic Entomology..... (6 cred.; sr.; prereq., 6, 63 or 65, Zool. 117-118-119)	I	MWF	302Ad	Mr. Ruggles
197f,w,s,su	Introduction to Research..... (5 or more cred.; sr.; prereq., work as prescribed by the division)	Ar	Ar	Ar	Mr. Granovsky, Mr. Mickel, Mr. Riley, Mr. Shepard, Mr. Tanquary

FORESTRY

No.	Title	Hour	Day	Bldg.	Instructor
1f	General Forestry	III	TThS	102Hr	Mr. Cheyney
	(3 cred.; no prereq.)				
2su	Field Dendrology	Given at Itasca Park			
	(1 cred.; no prereq.)				
3w	Dendrology	II	TThS	302Hr	Mr. Schmitz
	(3 cred.; no prereq.)				
4s	Dendrology				
	(4 cred.; no prereq.)				
	Lect.	III	MWF	301Hr	Mr. Schmitz
	Lab.	II, III	S	301Hr	Mr. Rees
5su	Field Silviculture	Given at Itasca Park			Mr. Cheyney
	(2 cred.; no prereq.)				
6su	Field Mensuration	Given at Itasca Park			Mr. Brown
	(1 cred.; no prereq.)				
7f-8w	Forest Mensuration				
	(10 cred.; all; prereq., 6)				
	Lect.	IV	MTWF	102Hr	Mr. Brown
	Sec. 1 Lab.	VII, VIII, IX	M	302Hr	
	2	I, II, III	S	302Hr	
20w	Grazing	II	TThS	301Hr	Mr. Allison
	(3 cred.; soph., jr., sr.; no prereq.)				
23†	Factory Experience	Ar	Ar	Ar	
	(3 to 5 cred.; jr., sr.; prereq., 33-34)				

* Offered on the Minneapolis campus.

† Arrangements for this course must be made in advance.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
27w	Farm Wood Lots and Windbreaks... (3 cred.; no prereq.‡)	IV	MWF	302Hr	Mr. Cheyney
28w	Logging (3 cred.; jr., sr.; no prereq.)	III	MWF	302Hr	Mr. Brown
29f	Sawmill and Woodworking Machinery (3 cred.; soph., jr., sr.)	IV	MWF	302Hr	Mr. Cheyney
30s	Wood Seasoning (3 cred.; jr., sr.; prereq., 33-34)	I	TThS	301Hr	Mr. Rees
31s	Logging Laboratory (1 cred.; jr., sr.; no prereq.)	Given at Cloquet			Mr. Brown
32f,w	Forest Reports (2 cred.; soph., jr., sr.; no prereq.)	Ar	Ar	Ar	Mr. Cheyney
33f-34w	Wood Structure and Identification... (6 cred.; jr., sr.; prereq., 3-4)	VI, VII, VIII	WF	303Hr	Mr. Rees
37s	Forest Protection (3 cred.; jr., sr.; prereq., 127)	Given at Cloquet			Mr. Hansen
48w	Forest Products (3 cred.; no prereq.)	I	TThS	301Hr	Mr. Allison
50s	House and Furniture Woods..... (2 cred.;‡ soph., jr., sr.; no prereq.)	III, IV	TS	303Hr	Mr. Rees
57f	Uses of Wood I (3 cred.; sr.; prereq., 33-34)	IV	MWF	301Hr	Mr. Rees
58w	Uses of Wood II (3 cred.; sr.; prereq., 33-34)	IV	MWF	303Hr	Mr. Rees
59s	Uses of Wood III (3 cred.; sr.; prereq., 57, 58)	VI, VII, VIII	TTh	303Hr	Mr. Rees
101w	Advanced Dendrology (3 cred.; jr., sr.; prereq., 3-4)	I	MWF	301Hr	Mr. Rees
111f-112w	Advanced Forest Mensuration..... (6 cred.; sr.; prereq., 8)	Ar	Ar	Ar	Mr. Brown
113f	Wood Pulp and Paper..... (3 cred.; jr., sr.; prereq., 33-34, Chem. 3 or 10)	III	MWF	301Hr	Mr. Allison
114f-115w	Mechanical and Physical Properties of Wood (6 cred.; sr.; prereq., 33-34)	I, II	TThS	303Hr	Mr. Rees
116s	Mechanical and Physical Properties of Wood (3 cred.; sr.; prereq., 33-34)	I, II	MWF	303Hr	Mr. Rees
119w	Advanced Wood Structure I..... (3 cred.; sr.; prereq., 33-34)	VI, VII, VIII	TTh	303Hr	Mr. Rees
120s	Advanced Wood Structure II..... (3 cred.; sr.; prereq., 33-34)	VI, VII, VIII	WF	303Hr	Mr. Rees
122f-123w	Forestry Seminar (2 cred.; sr.; no prereq.)	IX	W	302Hr	Mr. Schmitz, Mr. Allison, Mr. Cheyney
125s	Wood Preservation (3 cred.; jr., sr.; prereq., 33-34)	IV	MWF	301Hr	Mr. Schmitz
126f	Silvics (3 cred.; jr., sr.; no prereq.)	IV	TThS	301Hr	Mr. Cheyney
127w	Silviculture (3 cred.; jr., sr.; prereq., 126)	III	TThS	301Hr	Mr. Cheyney
128s	Silviculture Laboratory (7 cred.; jr., sr.; prereq., 127)	Given at Cloquet			Mr. Cheyney
129f	American Silvicultural Practice..... (3 cred.; jr., sr.; prereq., 127)	III	MWF	302Hr	Mr. Cheyney

‡ Not open to students majoring in Forestry.

No.	Title	Hour	Day	Bldg.	Instructor
130f	Forestry Valuation	I	MTWThF	301Hr	Mr. Allison
	(5 cred.; jr., sr.; no prereq.)				
131w	Forest Policy and Administration....	IV	MTWFS	301Hr	Mr. Allison
	(5 cred.; jr., sr.; no prereq.)				
132s	Forest Regulation Laboratory	Given at Cloquet			Mr. Allison
	(7 cred.; jr., sr.; prereq., 130)				
134f-135w	Forest Problems	IV	TS	Ar	Mr. Schmitz
	(4 cred.; sr. class.)				
136f	Forest Economics	II	MWF	301Hr	Mr. Allison
	(3 cred.; jr., sr.; prereq., 131, Agr. Econ. 2)				
140f	Forest Working Plans.....	III	TThS	301Hr	Mr. Allison
	(3 cred.; sr.; prereq., 128, 132)				

FRESHMAN ASSEMBLY

During the fall quarter all freshmen are required to attend the assembly first hour on Tuesdays. See *Official Daily Bulletin* for place of meeting and further announcements.

GEOLOGY AND MINERALOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w*†‡	General Geology				
	(6 cred.; all; no prereq.)				
	Lect.	II	TThS	210P	Mr. Thiel
Af-Bw	General Geology Laboratory (Dynamic and Historical)				
	(4 cred.; all; prereq., 1-2 or parallel)				
	Sec. 1	I, II	MW	220P	Ar
	2	VI, VII	MW	220P	Ar
1f-3w*†‡	General Geology				
	(Same as 1f-2w)				
	Lect.	III	TThS	110P	Mr. Emmons
	Rec.	III	F	110P	Mr. Emmons
Af-Cw*	General Geology Laboratory (Dynamic and Economic)				
	(4 cred.; prereq., 1-3 or parallel)				
	Sec. 1	III, IV	MW	220P	Ar
	2	VI, VII	TTh	220P	Ar
1w-2s*†‡	General Geology				
	(Same as 1f-2w)				
	Lect.	IV	MWF	110P	Mr. Dutton
	Rec.	IV	T	110P	Mr. Dutton
Aw-Bs*	General Geology Laboratory (Dynamic and Historical)				
	(4 cred.; prereq., 1-2 or parallel)				
		VI, VII	WF	220P	Ar
1w-3s*†‡	General Geology				
	(Same as 1f-2w)				
	Lect.	II	MWF	206P	Mr. Dutton
	Rec.	II	S	206P	Mr. Dutton

* Offered on the Minneapolis campus.

† The entire course must be completed before credit is given for any quarter.

‡ Course 2 may be followed by 3, 4, or 11; or 3 by 2, for a three-quarter sequence.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
Aw-Cs*	General Geology Laboratory (Dynamic and Economic)	I, II	TTh	216P	
	(4 cred.; prereq., 1-3 or parallel)				
1s*†	General Geology (Dynamic and Historical, or Economic)				
	(3 cred.; all; no prereq.)				
	Lect.	III	MWF	110P	Mr. Dutton
	Rec.	III	Th		Mr. Dutton
As*	General Geology Laboratory	III, IV	TS	220P	Ar
	(2 cred.; prereq., 1 or parallel)				
2f*††	Historical Geology				
	(2nd qtr. of 1-2)				
	Lect.	III	MWF	206P	Mr. Dutton
	Rec.	III	Th	206P	Mr. Dutton
Bf*	Historical Geology Laboratory	III, IV	TS	216P	Ar
	(2nd qtr. of A-B)				
8f,w,s*§	Introductory Geology				
	(5 cred.; all; no prereq.)				
	Sec. 1	I	MWThFS	210P	Mr. Thiel
	2(w)	IV	MTWFS	210P	
23w-24s*	Elements of Mineralogy				
	(3 cred.; soph., jr., sr.; prereq., course in chem.)				
	Lect.(w)	II	WF	110P	Mr. Gruner
	Rec.	VII	T	110P	
	Sec. 1 Lab.	VII-VIII	WF	100P	
	2	III-IV	TS	100P	
	Lect.(s)	II	MWF	206P	Mr. Gruner
	Rec.	IX	T		
	Sec. 1 Lab.	VII-VIII	M	100P	
	2	VI-VII	T		
		III-IV	M		
		VII-VIII	F		

(For other sections see the bulletin of the School of Mines and Metallurgy.)

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

HISTORY AND PHILOSOPHY OF EDUCATION

(COLLEGE OF EDUCATION)

No.	Title	Hour	Day	Bldg.	Instructor
1f,w,s*	Brief Course in the History of Education	IV	MTWFS	210Bu	Miss Alexander
	(5 cred.; jr., sr.; prereq., 6 cred. in psy.)				
3f,w,s*	Educational Sociology	III	MWF	Pt	Mr. Finney
	(3 cred.; jr., sr.; prereq., 6 cred. in psy.)				
5s	Public Education in the United States (3 cred.; jr., sr.; prereq., 6 cred. in psy.)	VIII	MWF	Ar	Miss Alexander

For additional courses see the bulletin of the College of Education.

* Offered on the Minneapolis campus.

† The entire course must be completed before credit is given for any quarter.

‡ Course 2 may be followed by 3, 4, or 11; or 3 by 2, for a three-quarter sequence.

§ Not open to students with credit in Geol. 1 or 29. Cannot be followed by Geol. 1 for credit.

HOME ECONOMICS

No.	Title	Hour	Day	Bldg.	Instructor
3f	Textiles (5 cred.; no prereq.) Sec. 1	I, II	MWThF	311,307HE	Miss Weller, Miss Willigar
	(Limited to 24 each) 2	III, IV	MTWF	311,307HE	Miss Willigar
3w	Textiles (Same as 3f) Sec. 1	I, II	MTWF	311,307HE	Miss Weller, Miss Willigar
	(Limited to 24 each) 2	III, IV	MTWF	311,307HE	Miss Willigar
3s	Textiles (Same as 3f) (Limited to 24)	I, II	MTWF	311,307HE	Miss Weller, Miss Willigar
4f,s	Textiles (S. L. and A., & Ed.)..... (3 cred.; no prereq.; not open to stu- dents in H.E.) (Limited to 24 each) Sec. 1	VI, VII VI, VII	MWF MWF	307HE 305HE	Miss Weller, Miss Willigar
11f,s	Clothing Planning and Construction, A (3 cred.; no prereq.) Sec. 1	I, II	MWF	304HE	Miss Gorham, Miss Willigar, Miss Anderson
	(Limited to 24 each) 2	I, II, III(f) I, II(s)	ThS TThS	304HE	Miss Gorham, Miss Willigar
	3	VI, VII, VIII	TTh	304HE	
11w	Clothing Planning and Construction, A (Same as 11f,s) Sec. 1	I, II	MWF	304HE	Miss Gorham
	(Limited to 24 each) 2	VI, VII, VIII	TTh	304HE	Miss Gorham
13f,s	Clothing Planning and Construction, B (3 cred.; prereq., 3, 11, 50, home pract. in garment making) Sec. 1	III, IV	MWF	304HE	Miss Willigar
	(Limited to 24 each) 2	I, II	MWF	305HE	Miss Gorham
13w	Clothing Planning and Construction, B (Same as 13f,s) Sec. 1	III, IV	MWF	304HE	Miss Anderson
	(Limited to 24 each) 2	VI, VII, VIII	TTh	305HE	Miss Willigar
15f,w,s	Clothing Problems (3 cred.; 3d qtr. fr., soph., jr.; pre- req., 3, 51 or parallel) (Limited to 30) Lect.	VI	Th	313HE	Miss Gorham
	Field trip	VI, VII	T	313HE	
16f,s	Problems in the Remodeling of Gar- ments and Construction of Chil- dren's Clothing (3 cred.; jr., sr.; prereq., 13, 53) (Limited to 24)	VI, VII	MWF	304HE	Miss Carlotta Brown, Miss Gorham
17w	Advanced Clothing (3 cred.; jr., sr.; prereq., 13, 53) (Limited to 24)	III, IV	MWF	305HE	Miss Carlotta Brown, Miss Gorham

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
17s	Advanced Clothing (Same as 17w) (Limited to 24)	III, IV and II, III	TS Th	305HE	Miss Carlotta Brown, Miss Gorham
18	Commercial Clothing Manufacture... (3 cred.; jr., sr.; prereq., 13, 53)	Not offered in 1932-33			
34f,w	Home Management: Operation and Maintenance, Lectures (3 cred.; jr., sr.; prereq., 83, H.E.Ed. 40 or parallel)	VIII	MWF	203HE	Miss Studley
35f,w,s	Home Management: Operation and Maintenance, Laboratory (6 cred.; jr., sr.; prereq., 83, home exp. in foods and cookery, Prev. Med. 52 and H.E.Ed. 40, 34 or parallel)	I and other hours	S	213HE	Miss Studley
44w	Home Economics Extension Work... (3 cred.; sr.; prereq., H.E.Ed. 42, 49 or parallel)	V 4 consecutive hours to be arranged on T, W, Th, or F p.m.	MW	213HE	Miss Newton
50f	Color and Design I (3 cred.; no prereq.) Sec. 1 (Limited to 24 each) 2 3	I, II I, II, III III, IV	MWF ThS MWF	402HE 402HE 402HE	Miss Segolson Miss Guttman Miss Fowler
50w	Color and Design I (Same as 50f) Sec. 1 (Limited to 24 each) 2	III, IV	MWF	402HE	Miss Guttman
50s	Color and Design I (Same as 50f) Sec. 1 (Limited to 24 each) 2	I, II	TThS	402HE	Miss Guttman
51f	Color and Design II (3 cred.; all; prereq., 50) Sec. 1 (Limited to 24 each) 2	I, II VI, VII	MWF	402HE	Miss Guttman
51w	Color and Design II (Same as 51f) Sec. 1 (Limited to 24 each) 2	I, II III, IV	MWF	401HE 401HE	Miss V. Gold- stein Miss V. Gold- stein
51s	Color and Design II (Same as 51f) Sec. 1 (Limited to 24 each) 2	I, II VI, VII, VIII	TThS TTh	401HE 402HE	Miss Guttman Miss Segolson
53f	Related Art Problems (3 cred.; soph., jr., sr.; prereq., 51 or 56) (Limited to 24)	I, II VI, VII	MWF MF	401HE 402HE	Miss Fowler Miss Fowler

No.	Title	Hour	Day	Bldg.	Instructor
53w	Related Art Problems (Same as 53f)				
	Sec. 1	VI, VII	MF	402HE	Miss Fowler
	(Limited to 24 each) 2	I, II	MWF	402HE	Miss Fowler
53s	Related Art Problems (Same as 53f)				
	Sec. 1	I, II	TS	402HE	Miss Segolson
	2	III, IV	MF	402HE	Miss Segolson
55f	Decorative Needlework and Other Crafts (3 cred.; prereq., 53 or parallel) (Limited to 24)	VI, VII, VIII	TTh	401HE	Miss Fowler
56f	Applications of Color and Design.... (3 cred.; † no prereq.)	VI, VII, VIII	TTh	402HE	Miss H. Gold- stein
57s	Batik and Other Crafts..... (3 cred.; prereq., 3, 53 or parallel) (Limited to 24)	VI, VII, VIII	TTh	110HE	Miss Fowler
60s	Institution Marketing (2 cred.; jr., sr.; prereq., 61 or paral- lel, 85)	III III, IV	W F	106HE	Miss King
61f,s	Quantity Cookery (4 cred.; 3d qtr. soph., jr., sr.; pre- req. 80 or 81)				
	(Limited to 12) Lect.	I	S	106HE	Miss King
	Sec. 1 Lab.	I, II, III	TTh	DH	Miss King
	2	I, II, III(f)	MW	DH	Miss King
61w	Quantity Cookery (Same as 61f,s)				
	Lect.	I	S	106HE	Miss King
	Sec. 1 Lab.	I, II, III	TTh	DH	
	(Limited to 12) 2	VI, VII, VIII	MW	DH	
63f,w,s	Institution Experience (3 cred.; 3d qtr. soph., jr., sr.; pre- req., 80 or 81)				
	Lect.	IV	F	Ar	Miss Dunning
	(Limited to 12) Lab.	IV, V	MW		
65f,w	Institution Equipment (2 cred.; jr., sr.; prereq., 61 or paral- lel, 63 or parallel)				
	Lect.	IX	W		Miss Hunt
	(Limited to 20) Lab.	VI, VII, VIII	F		
70f	Nutrition Survey (2 cred.; all; † no prereq.) (Limited to 45 each) 2	IV III	WF TTh	203HE	Miss Biester Miss Dinsmore
70w	Nutrition Survey (Same as 70f) (Limited to 45)	III	TTh	213HE	Miss Dinsmore
70s	Nutrition Survey (Same as 70f) Sec. 1* (Limited to 45) 2	VI VI	TTh TTh	Ar 203HE	Miss Biester Miss Dinsmore

* Offered on the Minneapolis campus.

† Intended for students in Science, Literature, and the Arts. Open to students in Home Economics only by permission of chief of division.

‡ Open to juniors and seniors in home economics only with consent of instructor.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
71f*	Social Interpretations for Dietitians.. (1 cred.; jr., sr.; no prereq.)	VIII, IX	T		Miss Gardiner
73f	Nutrition I (4 cred.; soph., § jr., sr.; prereq., Agr. Biochem. 4, Physiol. 4) (Limited to 24)	Lect. III Lab. VI, VII, VIII	MWF Th	211, 213HE	Miss Dinsmore
73s	Nutrition I (Same as 73f) (Limited to 24)	Lect. II Lab. VI, VII, VIII	MWF T	211, 213HE	Miss Strawn
75f	Dietetics Laboratory (2 cred.; jr., sr.; prereq., 170 or equivalent or parallel) (Limited to 20)	I, II	MW	107HE	Miss Hunt
75w	Dietetics Laboratory (Same as 75f) (Limited to 20)	I, II	MW	107HE	Miss Dinsmore
79s	Selected Problems for Dietitians..... (3 cred.; sr.; prereq., 170 or equiv.)	II	MWF	313HE	Miss Biester
80f	Food Preparation (5 cred.; prereq., Agr. Biochem. 4 or parallel)	VI, VII, VIII	MWF	209HE	Miss Davis
80w	Food Preparation (Same as 80f) (Limited to Sec. 1 20 each) 2	III, IV VI, VII, VIII	MTWF MWF	209HE 209HE	Miss Davis Miss Davis
80s	Food Preparation (Same as 80f) (Limited to Sec. 1 20 each) 2	III, IV VI, VII, VIII	MTWF MWF	209HE 209HE	Miss Davis Miss Davis
81s	Food Preparation (3 cred.; soph., jr., sr.; by examina- tion; prereq., same as 80f)	VI, VII, VIII	MW	207HE	Mrs. Niles
83f,s	Food Management (3 cred.; soph., jr., sr.; prereq., 70, 80 or 81, 85 or parallel) (Limited to Sec. 1 20 each) 2	III, IV III, IV, V III, IV, V	M W T	203, 207HE	Mrs. Niles
83w	Food Management (Same as 83f,s)	III, IV III, IV, V	M W	203, 207HE	Miss Davis Miss Davis
85f,w	Food Marketing (2 cred.; soph., jr.; no prereq.)	VI, VII	TTh	106HE	Miss Larson
85s	Food Marketing (Same as 85f,w) Sec. 1 2	VI, VII I, II	TTh MW	106HE 106HE	Miss Larson
89s	Camp Cookery (2 cred.; no prereq., not open to stu- dents in H.E.) (Limited to 20)	VI, VII	TTh	103HE	
90s*†	Home Management Problems for So- cial Workers (3 cred.; prereq., Soc. 52)	III	MWF	2J	Miss Studley

* Offered on the Minneapolis campus.

† Not open to students in Home Economics.

§ Open to sophomores only in their third quarter.

No.	Title	Hour	Day	Bldg.	Instructor
102f,s	Advanced Textiles (3 cred.; jr., sr.; prereq., 3, Agr. Biochem. 4, Agr. Econ. 3 or parallel) (Limited to 16)	VI, VII, VIII	TTh	307,311HE	Miss Phelps
107w	Textile Analysis (3 cred.; jr., sr.; prereq., 102, Agr. Biochem. 2)	VI, VII, VIII	MWF	311HE	Miss Phelps
115f,w	Clothing Economics (2 cred.; jr., sr.; prereq., 15 or equiv., Agr. Econ. 3)	III	TTh	213HE(f) 203HE(w)	Miss Weller
131f	Home Management: House Planning and Equipment (5 cred.; jr., sr.; prereq., 53) (Limited to 24)	III, IV	MTWF	401HE	Miss H. Goldstein
131w	Home Management: House Planning and Equipment (Same as 131f) (Limited to 24)	VI, VII	MTWF	401HE	Miss H. Goldstein
131s	Home Management: House Planning and Equipment (Same as 131f) Sec. 1 (Limited to 24 each) 2	III, IV VI, VII	MTWF MTWF	401HE 401HE	Miss V. Goldstein Miss H. Goldstein
136s	Problems in Income Management.... (3 cred.; sr.; prereq., 34, 35 or parallel, 170, Agr. Econ. 126 or parallel)	II	MWF	112HE	Miss Studley
150f,w,s	Art History and Appreciation..... (3 cred.; jr., sr.; prereq., 51)	VIII	MWF	313HE	Miss V. Goldstein
152w	Advanced Interior Design..... (3 cred.; jr., sr.; prereq., 53, 131 or parallel, 150) (Limited to 20)	I, II	MF	401HE	Miss V. Goldstein
154s	Advanced Costume Design (3 cred.; jr., sr.; prereq., 13, 53, 55 recommended) (Limited to 20)	I, II	TTh	401HE	Miss H. Goldstein
163s	Institution Management Problems.... (3 cred.; sr.; prereq., 61, 63) Lect. Lab.	III III, IV	TTh S	106HE DH	Miss Dunning
170f	Nutrition of the Family..... (3 cred.; jr., sr.; prereq., 70, 80 or 81, Agr. Biochem. 4, Physiol. 4) (Limited to 30)	I	MWF	313HE	Miss Dinsmore
170w	Nutrition of the Family..... (Same as 170f) (Limited to 30) Sec. 1 2	I II	MWF MWF	313HE 313HE	Miss Strawn
170s	Nutrition of the Family..... (Same as 170f) Sec. 1 2	I III	MWF MWF	313HE 313HE	Miss Strawn Miss Strawn

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
171f,w,s	Child Nutrition (3 cred.; jr., sr.; prereq., 170, H.E. Ed. 40) (Limited to 25)	Lect. III III*	MW F	203HE 202Pt	Miss Leichsenring, Miss Dinsmore
173s	Nutrition in Disease (3 cred.; sr.; prereq., 170, 175)	Lab. IV	Ar before completing registration	213HE	Miss Hunt
175f	Nutrition II (4 cred.; jr., sr.; prereq., 73) (Limited to 24)	I	MWF	213HE	Miss Hunt
175s	Nutrition II (Same as 175f) (Limited to 24)	Lect. II	MWF	211,213HE	Miss Strawn
176w	Advanced Nutrition (4 cred.; jr., sr.; prereq., 73, Agr. Biochem. 2) (Limited to 12)	Lab. VI, VII, VIII	M	211,213HE	Miss Dinsmore
177f	Digestion and Metabolism (3 cred.; sr.; prereq., 175)	III VI, VII, VIII	MWF T	211,213HE	Miss Dinsmore
177s	Digestion and Metabolism (Same as 177f) (Limited to 12)	II, III, IV II, III	TS Th	311HE 311HE	Miss Strawn
178f,w,s	Clinical Problems in Nutrition..... (2 cred.; jr., sr.; prereq., 71 or parallel, 75 or parallel, 170 or parallel, 175) (Limited to 8)	VI, VII, VIII II, III, IV	Th S	305HE	Miss Leichsenring
179f	Readings in Nutrition (2 cred.; jr., sr.; prereq., 170) (Limited to 15)	VI, VII, VIII IV	T TTh	Ar Ar	Miss Hunt
179w	Readings in Nutrition (Same as 179f) (Limited to 15)	IV	MW	213HE	Miss Strawn
179s	Readings in Nutrition (Same as 179f) (Limited to 15)	I	TTh	213HE	Miss Dinsmore
182f,w,s	Experimental Cookery (3 cred.; jr., sr.; prereq., 80) (Limited to 12)	Sec. 1 I, II, III I, II	Th T	107HE	Mrs. Niles
186w,s	Special Food Problems..... (3 cred.; sr.; prereq., 182)	2 VI, VII, VIII VI, VII, VIII	M W	107HE 107HE	Miss Child Miss Child
187w,s	Special Food Problems..... (5 cred.; sr.; prereq., 182, Agr. Biochem. 2)	VI, VII VI, VII, VIII	Th TTh	107HE	Miss Child
195s	Home Economics Survey..... (2 cred.; sr.; no prereq.)	Ar	Ar	Ar	Miss McNeal

* Offered on the Minneapolis campus.

HOME ECONOMICS EDUCATION

COLLEGE OF EDUCATION

No.	Title	Hour	Day	Bldg.	Instructor
40f,s	Child Training	IV	MWF	213HE	Mrs. Foster
	(3 cred.; jr., sr.; prereq., Psy. 1-2)				
40w*	Child Training	IV	MWF	202Pt	Mrs. Foster
	(Same as 40f,s)				
42f,w,s†	Special Methods and Observation of Teaching Home Economics.....	VI	MTWThF	213HE	Miss Rose
	(5 cred.; jr., sr.; prereq., H.E. 13, 53, 83, Psy. 1-2, Agr. Ed. 11 or Ed. Psy. 55)				
49f,w,s‡	Supervised Teaching of Home Economics				
	(6 cred.; sr.; prereq., 42)				
	Lect.	IX	T	213HE	Miss Rose
	Teaching	Ar	Ar	Ar	Miss Rose and others
49af,w,s†	Observation and Supervised Teaching of Home Economics				
	(8 cred.; sr.; prereq.,‡ only for those who have taken H.E.Ed. 42su)				
	Lect.	IX	TTh	213HE	Miss Rose
	Teaching	Ar	Ar	Ar	Miss Rose and others
141f	Vocational Education in Home Economics	Ar		Ar	Miss Clara Brown, Miss Rose
	(2 cred.; sr.; prereq., 42)				
142af,w	Educational Measurements in Home Economics	II	TTh	213HE	Miss Clara Brown
	(2 cred.; sr.; prereq., 42)				
143w,s	Home Economics Curricula.....	VIII	TTh	213HE	Miss Clara Brown, Miss Rose
	(2 cred.; jr., sr.; prereq., 42 or parallel)				
147w	Organization and Methods for Related Art Teaching	III	TTh	402HE	Miss H. Goldstein
	(3 cred.; jr., sr.; prereq., 42 or parallel; H.E. 53, 131 or parallel)				
149f,w,s	Research Problems	Ar	Ar	Ar	Miss McNeal, Miss Clara Brown
	(Cred. ar.; sr.; permission of instructor)				

HORTICULTURE

No.	Title	Hour	Day	Bldg.	Instructor
6f	Fruit Growing				
	(3 cred.; no prereq.)				
	Lect.	II	MW	102Hr	Mr. Alderman
	(Laboratory sections limited to 20 each)				
	Sec. 1 Lab.	I, II	F	8Hr	Mr. Brierley,
	2	VII, VIII	M	8Hr	Mr. Angelo

* Offered on the Minneapolis campus.

† A special fee of \$1 per credit hour is charged for this course.

‡ In addition to other prerequisites a student registering for this course must have received a grade of C or higher in each of the following courses: H.E. 3, 11, 13, 50, 51, 53, 80 or 81, and 83, must have passed a Qualifying Examination and must have completed home experience work in foods and clothing.

PROGRAM

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No.	Title	Hour	Day	Bldg.	Instructor
32s	Vegetable Growing (3 cred.; no prereq.) Lect.	II	MWF	102Hr	Mr. Krantz, Mr. Hutchins
50	Floriculture (2 cred.; no prereq.)	Not offered in 1932-33			
41s	Garden Flowers (2 cred.; no prereq.)	I	T	102Hr	Mr. Longley
52f	Commercial Floriculture (3 cred.; prereq., Bot. 1 or equiv.)	I, II	Th	102Hr	Mr. Longley, Mr. Sando
53w	Conservatory Plants and Florists' Flowers (3 cred.; prereq., Bot. 1 or equiv.)	VI, VII, VIII	M	102Hr	Mr. Longley, Mr. Sando
54s	Commercial Floriculture (3 cred.; prereq., Bot. 1 or equiv.)	VI, VII, VIII	M	102Hr	Mr. Longley, Mr. Sando
56	Plant Propagation (3 cred.; jr., sr.; prereq., Bot. 10 cred.)	Not offered in 1932-33			
71f	Elementary Landscape Design and Plant Materials (3 cred.; prereq., Bot. 10 cred.)	II	Th	107Hr	Mr. Longley
72s	Woody Plants and Garden Flowers... (2 cred.; prereq., Bot. 10 cred.)	I, II	TS	107Hr	Mr. Longley
74w	Principles of Landscape Design..... (3 cred.; jr., sr.; prereq., 71, Arch. 21 or Agr. Eng. 3)	II	T	107Hr	Mr. Longley
75f,w,s	Landscape Problems (3 cred.; jr., sr.; prereq., 74)	III	S	107Hr	Mr. Longley
76s	Landscape Construction (3 cred.; sr.; prereq., 71)	VI, VII	TTh	107Hr	Mr. Longley
93f	Judging Horticultural Crops..... (2 cred.; soph., jr., sr.; prereq., 6 or 32)	VI, VII, VIII	M	8aHr	Mr. Currence, Mr. Angelo, Mr. Longley
107f	Orchard Management (3 cred.; jr., sr.; prereq., 6)	IV	TS	103Hr	Mr. Brierley
110w	Horticultural Crop Breeding (3 cred.; jr., sr.; prereq., Agron. 131)	VI, VII	W	8Hr	Mr. Brierley
111	Systematic Pomology (3 cred.; jr., sr.; prereq., 6, Bot. 10 cred.)	III	TThS	106Hr	Mr. Wilcox
121w	Small Fruit Culture (3 cred.; soph., jr., sr.; prereq., 6 or 32, Bot. 10 cred.)	Not offered in 1932-33			
135f	Truck Crops and Potatoes I..... (3 cred.; jr., sr.; prereq., 32, Bot. 10 cred.)	I	MWF	102Hr	Mr. Brierley
137w	Truck Crops and Potatoes II..... (3 cred.; jr., sr.; prereq., 32, Bot. 10 cred.)	Ar	Ar	Ar	Mr. Currence
190f-191w-192s	Special Problems (6-12 cred.; jr., sr.; prereq., instructor's permission)	Ar	Ar	Ar	Mr. Alderman and staff
193f-194w	Horticultural Seminar (2 cred.; jr., sr.; prereq., 9 cred. in Hort.)	Ar	Ar	Ar	Horticultural staff

INORGANIC CHEMISTRY

SCHOOL OF CHEMISTRY

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w*	General Inorganic Chemistry..... (8 cred.; no prereq.)				
	Lect.	VII	MWF	225C	Mr. Pervier
	Lab.	VIII, IX	MW	210C	
3s*	General Inorganic Chemistry..... (4 cred.; prereq., 1-2)				
	Lect.	VII	MF	325C	Mr. Pervier
		IV	S	325C	
	Lab.	VIII, IX	MF	210C	
9f-10w*	General Inorganic Chemistry..... (10 cred.; prereq., 1 yr. h. s. chem.)				
	Lect.	VII	MWF	100C	Mr. Reyerson
	Lab.	VIII, IX	MWF	110C	

For additional courses see the bulletin of the School of Chemistry.

MATHEMATICS

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

No.	Title	Hour	Day	Bldg.	Instructor
3f*	Higher Algebra, Short Course..... (4 cred.; all; prereq., 1 yr. elem. alg.)	III	MWThF	206Pt	Ar
3w*	Higher Algebra, Short Course..... (Same as 3f)	IV	MTWF	206Pt	Ar
4f*	Trigonometry, Short Course..... (4 cred.; all; prereq., 3 or 5, or prep. higher alg.)	II	MTWF	206Pt	Ar
4w*	Trigonometry, Short Course..... (Same as 4f)	III	MWThF	206Pt	Ar
4s*	Trigonometry, Short Course..... (Same as 4f)	IV	MTWF	206Pt	Ar
5f*	Higher Algebra..... (5 cred.; all; prereq., 1 yr. elem. alg.)				
	Sec. 1	II	MWThFS	166Ph	Ar
	2	VI	MTWThF	166Ph	Ar
5w*	Higher Algebra..... (Same as 5f)	VI	MTWThF	133Ph	Ar
5s*	Higher Algebra..... (Same as 5f)	I	MWThFS	206Pt	Ar
6f*	Trigonometry..... (5 cred.; all; prereq., 3 or 5 or prep. higher alg.)	II	MWThFS	104F	Ar
6w*	Trigonometry..... (Same as 6f)	VI	MTWThF	105F	Ar
6s*	Trigonometry..... (Same as 6f)	IV	MTWFS	105F	Ar
7f*	College Algebra..... (5 cred.; all; prereq., 5 or prep. higher algebra, and 6)	I	MWThFS	105F	Ar
7w*	College Algebra..... (Same as 7f)	II	MWThFS	104F	Ar
7s*	College Algebra..... (Same as 7f)	VI	MTWThF	105F	Ar

* Offered on the Minneapolis campus.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
8f*	Commerce Algebra (5 cred.; pre-bus. stud.; prereq., 5 or prep. high. alg.)	I	MWThFS	166Ph	Ar
8w*	Commerce Algebra (Same as 8f)	II	MWThFS	206Pt	Ar
8s*	Commerce Algebra (Same as 8f)	VI	MTWThF	104F	Ar

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

MILITARY SCIENCE AND TACTICS

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w*	First Year Basic Course..... (No cred.; fr.; no prereq.)				
	Sec. 1	II	MWF	A	Ar
	2	III	MWF	A	Ar
	3	IV	MWF	A	Ar
	4	V	MWF	A	Ar
	5	VI	MWF	A	Ar
	6	VII	MWF	A	Ar
	7	VIII	MWF	A	Ar
3s*	First Year Basic Course..... (No cred.; fr.; no prereq.)				
	Sec. 1	II	MW & IX T	A	Ar
	2	III	MW & IX T	A	Ar
	3	IV	MW & IX T	A	Ar
	4	V	MW & IX W	A	Ar
	5	VI	MW & IX W	A	Ar
	6	VII	MW & IX W	A	Ar
	7	VIII	MW & IX W	A	Ar
	8	II	TTh & IX W	A	Ar
	9	III	TTh & IX W	A	Ar
4f-5w*	Second Year Basic Course..... (No cred.; soph.; prereq., 1-2.3)				
	Sec. 1	II	MWF	A	Ar
	2	III	MWF	A	Ar
	3	IV	MWF	A	Ar
	4	V	MWF	A	Ar
	5	VI	MWF	A	Ar
	6	VII	MWF	A	Ar
	7	VIII	MWF	A	Ar
6s*	Second Year Basic Course..... (No cred.; soph.; prereq., 4-5)				
	Sec. 1	II	MW & IX T	A	Ar
	2	III	MW & IX T	A	Ar
	3	IV	MW & IX T	A	Ar
	4	V	MW & IX W	A	Ar
	5	VI	MW & IX W	A	Ar
	6	VII	MW & IX W	A	Ar
	7	VIII	MW & IX W	A	Ar
	8	II	TTh & IX W	A	Ar
	9	III	TTh & IX W	A	Ar

* Offered on the Minneapolis campus.

No.	Title	Hour	Day	Bldg.	Instructor
51f-52w*	First Year Advanced Course.....	Total of five hours to be taken as follows:			
	(6 cred.; prereq., 4-5-6)	One of the two-hour sections:			
	Sec. 1	II	TTh	A	Ar
	2	III	TTh	A	Ar
		One of the three-hour sections:			
	Sec. 1	II	MWF	A	Ar
	2	III	MWF	A	Ar
	3	VI	MWF	A	Ar
	4	VIII	MWF	A	Ar
	53s*	First Year Advanced Course.....	Total of five hours to be taken as follows:		
(3 cred.; prereq., 4-5-6)		One of the four-hour sections:			
Sec. 1		II	MTWTh	A	Ar
2		III	MTWTh	A	Ar
		One of the drill sections:			
		IX	T or W	A	Ar
54f-55w*	Second Year Advanced Course.....	Total of five hours to be taken as follows:			
	(6 cred.; prereq., 4-5-6)	One of the two-hour sections:			
	Sec. 1	II	TTh	A	Ar
	2	III	TTh	A	Ar
		One of the three-hour sections:			
	Sec. 1	II	MWF	A	Ar
	2	III	MWF	A	Ar
	3	VI	MWF	A	Ar
	4	VIII	MWF	A	Ar
	56s*	Second Year Advanced Course.....	Total of five hours to be taken as follows:		
(3 cred.; prereq., 4-5-6)		One of the two-hour sections:			
Sec. 1		II	MW	A	Ar
2		III	MW	A	Ar
3		II	TTh	A	Ar
4		III	TTh	A	Ar
		One of the drill sections:			
Sec. 1		II	MW & IX T	A	Ar
2		III	MW & IX T	A	Ar
3		IV	MW & IX T	A	Ar
4		V	MW & IX W	A	Ar
5		VI	MW & IX W	A	Ar
6		VII	MW & IX W	A	Ar
7		VIII	MW & IX W	A	Ar
8	II	TTh & IX W	A	Ar	
9	III	TTh & IX W	A	Ar	

PHYSICAL EDUCATION FOR MEN

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w-3s*†	Freshman Physical Education.....				
	(Cred.; † fr.; no prereq.)				
	Sec. 1	I	MWF	202S	
	2 (w, s only)	I	TThS	202S	
	(Sections limited to 60 each)	3	II	MWF	202S
		4	II	TThS	202S
		5	III	MWF	202S
		6	III	TThS	202S
		7	IV	MWF	202S
		8	VI	MWF	202S
		9	VII	MWF	202S
		10	VIII	MWF	202S

* Offered on the Minneapolis campus.

† Courses 1-2-3 and 4 carry a total of 3 credits. Both courses must be completed before credit is given.

‡ A maximum of \$1.50 is charged all students registered for one or more of these courses.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
4w*	Freshman Hygiene (Cred.†)	IV	S	202S	
7f-8w-9s*	Advanced Leaders (3 cred.; soph., jr., sr.; prereq., 1-2-3)				
	Lect.	IV	T	206A	Mr. Kellier
	Lab.	Ar	Ar		
10f-11w-12s*¶	Minor Sports (6 cred.; soph., jr., sr.; prereq., 1-2-3)				
	Lect.	IV	S	206A	
	Lab.	IV	MWF		
16f-17w-18s*¶	Drill Substitution (No cred.; by petition only; no prereq.)				
	Sec. 1	II	MWF	S	
	2	III	MWF		
	3	IV	MWF		
30s*¶	Athletic Training and First Aid.....	I	MWF	206A	Dr. Cooke

For additional courses see the bulletin of the College of Education.

PHYSICAL EDUCATION FOR WOMEN

No.	Title	Hour	Day	Bldg.	Instructor
1f*‡	Freshman Physical Education..... (1 cred.; required of all students; no prereq.)				
	Sec. 1 Lect.	I	W	201WGm	Ar
	2	II	T	201WGm	Ar
	3	II	Th	201WGm	Ar
	4	III	Th	201WGm	Ar
	5	IV	M	201WGm	Ar
	6	IV	T	201WGm	Ar
	7	VI	W	201WGm	Ar
	8	VI	Th	201WGm	Ar
	Sec. 1 Lab.	II	MWF	3,151,153WGm	Ar
	2	III	MWF	3,151,153WGm	Ar
	3	III	TThS	3,151,153WGm	Ar
	4	IV	MWF	3,151,153WGm	Ar
	5	VI	MWF	3,151,153WGm	Ar
	6	VIII	MWF	3,151,153WGm	Ar
2w-3s*‡§	Freshman Physical Education..... (Same as 1f)				
	Sec. 1 Lab.	II	MWF	3,151,153WGm	Ar
	2	III	MWF	3,151,153WGm	Ar
	3	III	TThS	3,151,153WGm	Ar
	4	IV	MWF	3,151,153WGm	Ar
	5	VI	MWF	3,151,153WGm	Ar
	6	VIII	MWF	3,151,153WGm	Ar
4s*¶	Preliminary Hygiene (for nurses and transfer students) (No cred.; no prereq.)	VI	W	201WGm	Ar

* Offered on the Minneapolis campus.

† Courses 1-2-3 and 4 carry a total of 3 credits. Both courses must be completed before credit is given.

‡ A fee of \$2.50 is charged for this course, provided that no student shall be charged more than \$3.50, regardless of the number of physical education courses pursued in any one quarter.

§ Students may enter any quarter.

¶ A maximum of \$1.50 is charged all students registered for one or more of these courses.

|| Students who have not completed the requirement in preliminary hygiene may register for this course or for Preventive Medicine 3.

No.	Title	Hour	Day	Bldg.	Instructor
7f,8w†*¶	Sophomore Gymnastics	IV	TS	153WGm	Ar
	(No cred.; soph.; prereq., 1-2-3)				
9s*¶	Sophomore Archery				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	II	TTh	151WGm	Ar
	2	IV	TS		Ar
	3	VII	WF		Ar
10f-11w†*¶	Sophomore Orthopedic and Individual Gymnastics				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	I	WF	3WGm	Ar
	2	IV	TS	3WGm	Ar
	3	VIII	TTh	3WGm	Ar
12s*¶	Sophomore Orthopedic and Individual Gymnastics	IV	TS	3WGm	Ar
	(Same as 10f-11w)				
13f-14w- 15s‡*¶	Sophomore Dancing	V½	MW	151WGm	Ar
	(No cred.; soph.; prereq., 1-2-3)				
13f,s-14w*¶¶	Sophomore Dancing	II	TTh	151WGm	Ar
	(Same as 13f-14w-15s)				
16f,17w†*¶	Sophomore Games and Folk Dancing..	I	WF	151WGm	Miss Dickson
	(No cred.; soph.; prereq., 1-2-3)				
18s*¶	Tennis				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	I	TTh	151WGm	Ar
	2	IV	TS	151WGm	Ar
	3	VI	TTh	151WGm	Ar
	4	VII	WF	151WGm	Ar
	5	VIII	TTh	151WGm	Ar
19f*¶	Sophomore Hockey				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	V	MW	151WGm	Ar
	2	VII	WF	151WGm	Ar
	3	VIII	TTh	151WGm	Ar
20w*¶	Sophomore Basket-Ball				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	V	MW	151WGm	Ar
	2	VII	WF	151WGm	Ar
	3	VIII	TTh	151WGm	Ar
21s*¶	Sophomore Baseball	V	MW	151WGm	Ar
	(No cred.; soph.; prereq., 1-2-3)				
22f-23w§*¶¶	Sophomore Elem. Swimming.....				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	II	TTh	51WGm	Miss Starr
	2	III	MW	51WGm	and others
	3	IV	TS	51WGm	
	4	IV	MW	51WGm	
	5	VI	TTh	51WGm	
	6	VII (fall only)	WF	51WGm	
	7	VIII (3:30)	TTh	51WGm	
	8	VIII (4:00)	TTh	51WGm	

* Offered on the Minneapolis campus.

† Students may enter any quarter.

‡ Students may not enter the second or third quarter of the course.

¶ A fee of \$2 is charged for this course, provided that no student shall be charged more than \$3.50, regardless of the number of physical education courses pursued in any one quarter.

§ The second quarter is not open to students who have not had the first quarter.

¶¶ No student may register for more than two quarters of swimming without permission. Course 22 is never closed for senior registration.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
22As*††	Soph. Elem. Swimming, Intensive.... (No cred.; soph.; prereq., 1-2-3, 22, or some knowledge of swim.)	Hours as for	22f-23w		
22w-23s*††‡	Sophomore Elem. Swimming..... (Same as 22f-23w)	VII	WF	51WGM	Ar
24f,s‡	Sophomore Horseback Riding..... (No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	VIII	TTh	Ar	Miss Starr
	2	IX	TTh	Ar	Miss Starr
25f,s-					
26w†‡*††	Sophomore Intermed. and Advanced Swimming				
	(No cred.; soph.; prereq., 1-2-3, ele- mentary swimming test)				
	Sec. 1	III	TTh	51WGM	Ar
	2	VIII	MW	51WGM	Ar
	3	VI	MW	51WGM	Ar
27s**††	Sophomore Golf—Elementary				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	I	TTh	Ar	
	2	II	TTh	Ar	
	3	II	MW	Ar	
	4	VII	TTh	Ar	
28f**††	Sophomore Golf—Advanced	VI	TTh	Ar	Ar
	(No cred.; soph.; prereq., 1-2-3)				
30s*††	Sophomore Life Saving and Water Sports	IX			
	(No cred.; soph.; prereq., 1-2-3, adv. swim. test)				
31w††*††	Sophomore Skating				
	(No cred.; soph.; prereq., 1-2-3)				
	Sec. 1	VII	WF	Ar	
	2	II	TTh	Ar	

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

PHYSIOLOGY
MEDICAL SCHOOL

No.	Title	Hour	Day	Bldg.	Instructor
4f,w,s*	Human Physiology	III, IV	MWF	315MH	Dr. Lyon, Dr. King, and others
	(4 cred.; prereq., 1 qtr. zool., 1 qtr. chem.)				
56f*	Physiologic Chemistry	I	TThS		Dr. McClendon
	(3 cred.; prereq., gen. chem.)				
57s*	Physiologic Chemistry	I	TThS	214MH	Dr. Armstrong and others
	(4 cred.; jr., sr.; prereq., Zool. 5-6-7, IV Org. Chem.)	IV	M		

* Offered on the Minneapolis campus.

† The second quarter is not open to students who have not had the first quarter.

‡ No student may register for more than two quarters of swimming without permission. Course 22 is never closed for senior registration.

‡ Students registering for this course will pay for riding lessons at about \$1 per lesson. but not the regular physical education fee. Attendance at class hour is required for credit.

** Students must supply their own golf equipment. Golf course at university recreation field will be used for Courses 27s and 28f. Student tickets 10 for \$4.50 or 50 cents per ticket.

†† Class meetings will be fifty minutes in length, since weather and ice conditions will cause omissions at times.

‡‡ A fee of \$2 is charged for this course, provided that no student shall be charged more than \$3.50, regardless of the number of physical education courses pursued in any one quarter.

No.	Title	Hour	Day	Bldg.	Instructor
59w-s*	Human Physiology				
	(6 cred.; jr., sr.; prereq., same as 57)				
	Lect.	I	TThS	310MH	Dr. Lyon,
		IV(w)	MF		Dr. King,
		II(s)	TTh		and others
	Lab.	II, III, IV	T		
	Quiz	II	T		
60s*	Physiology of Exercise				
	(4 cred.; jr., sr.; prereq., 4)				
	Lect.	I	TThS		Dr. Collins
	Lab.	VI, VII, VIII	W		
100f-101w*	Physiologic Chemistry				
	(10 cred.; jr., sr.; prereq., org. chem., phys.)				
	(Div. A and B primarily for medical students)				
	Lect.	IV	MWF		Dr. McClendon,
	Lab. Div. A	I, II, III	TTh	310MH	Dr. Hem- ingway, and others
	Lab. Div. B	I, II, III	FS		
	Lab. Div. C	VI, VII, VIII	TTh		

For additional courses see the bulletin of the Medical School.

PLANT PATHOLOGY AND BOTANY

No.	Title	Hour	Day	Bldg.	Instructor
1f	Plant Pathology	VII, VIII, IX	MWF	106,107PP	Mr. Stakman, Mr. Allison, Mr. Eide
	(5 cred.; jr., sr.; prereq., Bot. 9 cred.)				
7w-8s	Weeds and Grasses	III	TThS	100PP	Mr. Larson
	(6 cred.; soph., jr., sr.; prereq., Bot. 9 cred.)	IV	TS	100PP	
9f	Weeds and Seed Testing.....	III	TThS	100PP	Mr. Larson
	(3 cred.; soph., jr., sr.; prereq., Bot. 9 cred.)	IV	TS	100PP	
10w	Forest Pathology	VII, VIII, IX	MWF	106,107PP	Mr. Stakman, Mr. C. Chris- tensen
	(5 cred.; soph., jr., sr.; prereq., Bot. 9 cred.)				
10s	Forest Pathology	I	MWF	107PP	Mr. C. Chris- tensen
	(Same as 10w)	I, II	TThS	106,107PP	
12w	Seed Problems	Ar	Ar	Ar	Mr. Larson
	(3 cred.; jr., sr.; prereq., 9)				
105f-106w- 107s	M:ology	Ar	Ar	302PP	Mr. Freeman, Miss Dossdall
	(6 to 15 cred.; jr., sr.; prereq., 1 or 10)				
110w	Principles of Pathology	III, IV	MWF	106,107PP	Mr. Stakman, Mr. Allison
	(4 cred.; jr., sr.; prereq., 1 or 10, Bact. 41)				
111w	Diseases of Cereal Crops.....	VI, VII	MWF	106,107PP	Mr. J. J. Chris- tensen
	(3 cred.; jr., sr.; prereq., 1 or 10)				
112s	Diseases of Fruit Crops.....	VI, VII	MWF	106,107PP	Mr. Leach
	(3 cred.; jr., sr.; prereq., 1 or 10)				
113	Diseases of Vegetable Crops.....	Not offered in 1932-33			
	(3 cred.; jr., sr.; prereq., 1 or 10)				

* Offered on the Minneapolis campus.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
114	Advanced Forest Pathology..... (3 cred.; jr., sr.; prereq., 1 or 10)	Not offered in 1932-33			
116	Pathologic Histology	Not offered in 1932-33			
117	Diseases of Forage and Fiber Crops.. (3 cred.; jr., sr.; prereq., 1 or 10)	Not offered in 1932-33			
118f	Bacterial Diseases of Plants..... (3 cred.; jr., sr.; prereq., 1 or 10)	Ar	Ar	106,107PP	Mr. Leach
119s	Principles of Plant Disease Control.. (3 cred.; jr., sr.; prereq., 1 or 10)	Ar	Ar	Ar	Mr. J. J. Christensen, Mr. Allison
141f-142w	Insects in Relation to Plant Disease.. (6 cred.; prereq., 8 cred., Ent. or Plant Path.)	III, IV	TThS	302Ad	Mr. Granovsky, Mr. Leach
160f or w	Plant Microchemistry	Ar	Ar	Ar	Mr. Harvey, Mr. Landon
161w	Transport, Storage, and Ripening of Fruits and Vegetables..... (3 cred.; sr.; prereq., Plant Physiol. 5 cred.)	Ar	Ar	Ar	Mr. Harvey
162w	Physiological Relations of Crop Plants to Temperature	Ar	Ar	206PP	Mr. Harvey
	(3 cred.; sr.; prereq., Phys. 23)				

POULTRY HUSBANDRY

No.	Title	Hour	Day	Bldg.	Instructor
1f,w	Poultry	VI	MWF	102Ve	Mr. Hutt
	(3 cred.; no prereq.)				
2w	Poultry Judging	VI, VII, VIII	TTh	102Ve	Mr. Smith
	(3 cred.; prereq., 1)				
4s	Incubating and Brooding	VI	MWF	102Ve	Mr. Smith
	(3 cred.; no prereq.)				
5s	Advanced Poultry Judging	VI, VII, VIII	TTh	102Ve	Mr. Smith
	(3 cred.; prereq., 2)				
6s	Poultry Problems	Ar	Ar	Ar	Mr. Smith, Mr. Hutt
	(1 cred.; jr., sr.; prereq., 1)				
101w	Advanced Poultry Breeding.....	Ar	Ar	Ar	Mr. Hutt
	(3 cred.; jr., sr.; prereq., Agron. 131)				

PREVENTIVE MEDICINE AND PUBLIC HEALTH

MEDICAL SCHOOL

No.	Title	Hour	Day	Bldg.	Instructor
3f,w,s*	Personal Hygiene and Elementary Sanitation				
	(2 cred.; fr.; no prereq.)				
	Sec. 1 (women)	IV	TS	Ar	Dr. Bullard,
	(men)	IX	TTh	Ar	Dr. Ellis,
	2 (men)	IV	TS		Dr. Hessel-dorffer, Dr. Hinckley, Dr. Watson

* Offered on the Minneapolis campus.

No.	Title	Hour	Day	Bldg.	Instructor
52f,s‡	Health Care of the Family..... (3 cred.; prereq., Bact. 41, Physiol. 4) (Laboratory sections limited to 20)				
	Lect.	VIII	Th	313HE	Dr. Boynton
	Sec. 1 Lab.	VI, VII	TTh	WH	Miss Fisher
	2	VI, VII	MF	WH	
	3 (s only)	III, IV	TS	WH	
57s*	Health of Infant and Pre-school Child (2 cred.; jr., sr.; prereq., Zool. 1-2-3, Psy. 1-2, or 50, or 53)	III	TTh	Ar	Dr. Boynton
80w*	Health Supervision of the School Child (3 cred.; jr., sr.; prereq., 50, 52 or 53)	II	MWF	Ar	Dr. Diehl, Dr. Ellis

For additional courses see the bulletins of the Medical School and College of Education.

PSYCHOLOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

No.	Title	Hour	Day	Bldg.	Instructor
1f-2w*	General Psychology (6 cred.; † soph., jr., sr.; no prereq.)				
	Sec. 1	I	MWF	BuAud	Mr. Elliott
	2	III	MWF	BuAud	
1w-2s*	General Psychology (Same as 1f-2w) (Limited to 40)	IX	MWF	115Psy	

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

PUBLICATIONS AND RURAL JOURNALISM

No.	Title	Hour	Day	Bldg.	Instructor
10f-11w-12s	Agricultural Journalism (9 cred.; jr., sr.; prereq., Journ. 13- 14-15, 51-52)	VI	MWF	301Ad	Mr. Kirkwood
19w	Publicity (3 cred.; jr., sr.; prereq., Eng. A-B-C, Comp. 4-5-6, or exemption)	I	TThS	105En	Mr. Kirkwood

For additional courses see under the Department of Journalism in the bulletin of the College of Science, Literature, and the Arts.

RHETORIC

No.	Title	Hour	Day	Bldg.	Instructor
1f	Rhetoric I (3 cred.; no prereq.) (Limited to 35 each)				
	Sec. 1	I	MWF	308En	Miss Thurston
	2	II	MWF	310En	Miss Thompson
	3	III	MWF	310En	Miss Thompson
	4	IV	MWF	308En	Miss Thurston
	5	III	TThS	308En	Miss Thurston
	6	II	MWF	308En	Miss Thurston

* Offered on the Minneapolis campus.

† The full course must be completed before credit will be given.

‡ Section 2, spring quarter reserved for dental hygienists.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
1w	Rhetoric I (Same as 1f) (Limited to 35)	I	MWF	310En	Miss Thompson
1s	Rhetoric I (Same as 1f)	II	TThS	310En	Miss Thompson
2f	Rhetoric II (3 cred.; prereq., 1) (Limited to 35)	II	MWF	311En	Miss Thurston
2w	Rhetoric II (Same as 2f) (Limited to 35 each)				
	Sec. 1	II	MWF	310En	Miss Thompson
	2	III	TThS	308En	Miss Thurston
	3	II	TThS	310En	Miss Thompson
	4	III	MWF	310En	Miss Thompson
	5	I	MWF	308En	Miss Thurston
	6	IV	MWF	308En	Miss Thurston
	7	II	MWF	307En	Mr. Lansing
2s	Rhetoric II (Same as 2f) (Limited to 35)	II	MWF	308En	Miss Thurston
3f	Rhetoric III (3 cred.; prereq., 2) (Limited to 35)	IV	MWF	310En	Mr. Lansing
3s	Rhetoric III (Same as 3f) (Limited to 35 each)				
	Sec. 1	II	MWF	310En	Miss Thompson
	2	IV	MWF	310En	Miss Thompson
	3	I	MWF	308En	Miss Thurston
	4	III	MWF	307En	Mr. Lansing
	5	II	TThS	308En	Miss Thurston
	6	III	TThS	307En	Mr. Lansing
11f	Argumentation (3 cred.; soph., jr., sr.; prereq., 3, 22 recommended) (Limited to 30)	I	MWF	307En	Mr. Lansing
11w	Argumentation (Same as 11f) (Limited to 30)	III	MWF	307En	Mr. Lansing
11s	Argumentation (Same as 11f) (Limited to 30)	II	MWF	307En	Mr. Lansing
22f	Public Speaking (3 cred.; soph., jr., sr.; prereq., 3) (Limited to 20)				
	Sec. 1	I	MWF	311En	Mr. Routledge
	2	III	MWF	311En	Mr. Routledge
22w	Public Speaking (Same as 22f) (Limited to 20)				
	Sec. 1	I	MWF	311En	Mr. Routledge
	2	II	MWF	311En	
	3	III	MWF	311En	
22s	Public Speaking (Same as 22f) (Limited to 20)	III	MWF	311En	Mr. Routledge

AGRICULTURE, FORESTRY, AND HOME ECONOMICS

No.	Title	Hour	Day	Bldg.	Instructor
23f,w,s	Public Speaking (5 cred.; soph., jr., sr.; prereq., 3) (Limited to 30)	IV	MTWFS	311En	Mr. Routledge
24s	Advanced Public Speaking (3 cred.; soph., jr., sr.; prereq., 22)	II	MWF	311En	Mr. Routledge
28f	Play Production (3 cred.; soph., jr., sr.; prereq., 3)	III	TThS	AdAud	Mr. Routledge
29s	Advanced Play Production..... (3 cred.; jr., sr.; prereq., permission of instructor)	III	TThS	311En	Mr. Routledge
31f	Survey of English Literature I..... (5 cred.; soph., jr., sr.; prereq., 3) (Limited to 40)	III	MTWThF	307En	Mr. Lansing
31w	Survey of English Literature I..... (Same as 31f) (Limited to 40)	II	MTWThF	308En	Miss Thurston
31s	Survey of English Literature I..... (Same as 31f) (Limited to 40)	III	MTWThF	308En	Miss Thurston
32f.s	Survey of English Literature II..... (3 cred.; soph., jr., sr.; prereq., 3) (Limited to 35)	III	TThS	310En	Miss Thompson
33w,s	Contemporary Literature (3 cred.; soph., jr., sr.; prereq., 3)	IV	MWF	307En	Mr. Lansing
34f	Books and Reading..... (1 cred.; soph., jr., sr.; no prereq.)	IV	T	310En	Miss Thompson

SOCIOLOGY AND SOCIAL WORK

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

No.	Title	Hour	Day	Bldg.	Instructor
1f,w	Introduction to Sociology..... (3 cred.; 3d qtr. fr., soph., jr., sr.; no prereq.)	III	TThS	204Da	Mr. Williams
1s	Introduction to Sociology (Same as 1f,w)	I	TThS	204Da	Mr. Williams
14f,w	Rural Sociology (3 cred.; soph., jr., sr.; prereq., 1 or jr. class)	I	TThS	204Da	Mr. Williams
114s	Rural Social Institutions..... (3 cred.; jr., sr.; prereq., 4 courses in soc. or 1 and 15 cred. in soc. sci., educ., phil., or psy.)	I	MWF	204Da	Mr. Murchie

For additional courses and additional sections of the above courses offered on the Minneapolis campus, see the bulletin of the College of Science, Literature, and the Arts.

SOILS

No.	Title	Hour	Day	Bldg.	Instructor
6w	Soils (5 cred.; soph., jr., sr.; prereq., Agr. Biochem. 4)	II	MTWThF	204So	Mr. Alway, Mr. Rost
101w	Chemical Analysis of Soils..... (3 to 5 cred.; jr., sr.; prereq., 6, Quant. Anal.)				
	Lect.	IV	T	204So	Mr. Rost
	Lab.	Ar	Ar	Ar	

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
102w,s	Special Problems in Soils..... (Cred. assigned according to amount of work; jr., sr.; prereq., 101 or 108)	Ar	Ar	Ar	Mr. Alway, Mr. Rost
104s	Soil Surveying (3 cred.; jr., sr.; prereq., 108)	Ar	Ar	Ar	Mr. McMiller
107s	Fertilizers (3 cred.; jr., sr.; prereq., 6)	II	TThS	204So	Mr. Rost
108w	Physical Properties of Soils..... (3 cred.; jr., sr.; prereq., 6)				
	Lect.	VI	W	204So	Mr. McMiller
	Lab.	VII, VIII, IX VI, VII, VIII	W F	204So	Mr. McMiller

VETERINARY MEDICINE

No.	Title	Hour	Day	Bldg.	Instructor
2f-3w-4s	Comparative Anatomy and Physiology of Domestic Animals (9 cred.;† soph., jr., sr.; no prereq.)	VI(f) I(w and s)	MWF TThS	103Ve 103Ve	Mr. Kernkamp Mr. Nilson
6f	Physiology of Reproduction..... (4 cred.; jr., sr.; prereq., 2-3-4)	IV	MTWF	103Ve	Mr. Boyd
9w-10s	Veterinary Studies (6 cred.;‡ jr., sr.; prereq., Bact. 41)	III	TThS	102Ve	Mr. Donham
12w	Infectious Diseases (3 cred.; jr., sr.; prereq., 2-3-4, Bact. 41)	I	MWF	103Ve	Mr. Fitch
101w-102s	Advanced Anatomy of Domestic Animals (6 cred.; jr., sr.; prereq., 2 or equiv.) (Limited to 9)	Ar	Ar	Ar	Mr. Kernkamp
103w-104s	Advanced Comparative Physiology.... (6 cred.;§ jr., sr.; prereq., 3-4 or equiv.)				
	Lect.	I	WF	Ar	Mr. Nilson
	Lab.	VI, VII, VIII	Th		

ZOOLOGY

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

No.	Title	Hour	Day	Bldg.	Instructor
14f-15w-16s*¶	General Zoology (Agr., For.)..... (9 cred.;§ no prereq.)	VI, VII, VIII	TTh	101,313Z	Mr. Dawson
17f-18w*¶	General Zoology (H.E.)..... (6 cred.;§ no prereq.)	VII, VIII, IX	TTh	101,313Z	Mr. Turner

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

* Offered on the Minneapolis campus.

† The full course must be completed before credit will be given. The course may be started at the opening of any quarter.

‡ Full credit will not be allowed for this course when other courses in this division are completed. Students pursuing other courses in Veterinary Medicine should apply to the division for adjustment of credit. The full course must be completed before credit will be given.

§ The full course must be completed before credit will be given.

¶ A special fee of \$1 per quarter will be charged for this course.

The Bulletin *of the University of* **Minnesota**

The School of Business Administration
Part II

Announcement of Program for the Year
1932-1933



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1932							1933													
JULY							JANUARY							JULY						
Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa
..	..	..	..	..	1	2	1	2	3	4	5	6	7	..	..	..	..	..	..	1
3	4	5	6	7	8	9	8	9	10	11	12	13	14	2	3	4	5	6	7	8
10	11	12	13	14	15	16	15	16	17	18	19	20	21	9	10	11	12	13	14	15
17	18	19	20	21	22	23	22	23	24	25	26	27	28	16	17	18	19	20	21	22
24	25	26	27	28	29	30	29	30	31	..	..	..	..	23	24	25	26	27	28	29
31	..	..	..	..	..	..	..	..	..	..	..	..	..	30	31	..	..	..	..	..
AUGUST							FEBRUARY							AUGUST						
..	1	2	3	4	5	6	..	..	..	1	2	3	4	..	..	..	..	..	..	..
7	8	9	10	11	12	13	5	6	7	8	9	10	11	..	..	1	2	3	4	5
14	15	16	17	18	19	20	12	13	14	15	16	17	18	6	7	8	9	10	11	12
21	22	23	24	25	26	27	19	20	21	22	23	24	25	13	14	15	16	17	18	19
28	29	30	31	..	..	..	26	27	28	..	..	..	..	20	21	22	23	24	25	26
..	..	..	..	..	..	..	..	..	..	..	..	..	..	27	28	29	30	31	..	..
SEPTEMBER							MARCH							SEPTEMBER						
..	..	..	..	1	2	3	..	..	..	1	2	3	4	..	..	..	..	..	1	2
4	5	6	7	8	9	10	5	6	7	8	9	10	11	3	4	5	6	7	8	9
11	12	13	14	15	16	17	12	13	14	15	16	17	18	10	11	12	13	14	15	16
18	19	20	21	22	23	24	19	20	21	22	23	24	25	17	18	19	20	21	22	23
25	26	27	28	29	30	..	26	27	28	29	30	31	..	24	25	26	27	28	29	30
..
OCTOBER							APRIL							OCTOBER						
..	..	..	..	..	..	1	..	..	..	..	..	..	1	1	2	3	4	5	6	7
2	3	4	5	6	7	8	2	3	4	5	6	7	8	8	9	10	11	12	13	14
9	10	11	12	13	14	15	9	10	11	12	13	14	15	15	16	17	18	19	20	21
16	17	18	19	20	21	22	16	17	18	19	20	21	22	22	23	24	25	26	27	28
23	24	25	26	27	28	29	23	24	25	26	27	28	29	29	30	31	..	..	..	..
30	31	..	..	..	..	..	30	..	..	..	..	..	..	..	..	..	..	..	..	..
..
NOVEMBER							MAY							NOVEMBER						
..	1	2	3	4	5	..	..	1	2	3	4	5	6	..	..	..	1	2	3	4
6	7	8	9	10	11	12	7	8	9	10	11	12	13	5	6	7	8	9	10	11
13	14	15	16	17	18	19	14	15	16	17	18	19	20	12	13	14	15	16	17	18
20	21	22	23	24	25	26	21	22	23	24	25	26	27	19	20	21	22	23	24	25
27	28	29	30	..	..	..	28	29	30	31	..	..	..	26	27	28	29	30	..	..
..
DECEMBER							JUNE							DECEMBER						
..	..	..	..	1	2	3	..	..	..	..	1	2	3	..	..	..	..	..	1	2
4	5	6	7	8	9	10	4	5	6	7	8	9	10	3	4	5	6	7	8	9
11	12	13	14	15	16	17	11	12	13	14	15	16	17	10	11	12	13	14	15	16
18	19	20	21	22	23	24	18	19	20	21	22	23	24	17	18	19	20	21	22	23
25	26	27	28	29	30	31	25	26	27	28	29	30	..	24	25	26	27	28	29	30
..	..	..	..	..	..	..	..	..	..	..	..	..	..	31	..	..	..	..	..	..

UNIVERSITY CALENDAR

1932-33

1932		<i>Fall Quarter</i>	
September	22	Thursday	Payment of fees closes, except for new students
September	26	Monday	Entrance tests
September	26-27		Registration for Freshman Week for all new students entering the freshman class
September	26-30		Examinations for removal of conditions Physical examinations
September	27-30		Registration period, ¹ College of Science, Literature, and the Arts
September	28-October 1		Freshman Week
September	29-30		Registration days ¹ for all colleges not included above except the College of Engineering and Architecture and the School of Chemistry
September	30	Friday	Payment of fees for new students closes
October	3	Monday	Fall quarter classes begin, 8:30 a.m. ²
October	20	Thursday	Senate meeting, 4:30 p.m.
October	29	Saturday	Homecoming Day
November	8	Tuesday	General Election Day; a holiday (except for extension)
November	9	Wednesday	Mid-quarter grades due
November	11	Friday	Armistice Day Convocation
November	24	Thursday	Thanksgiving Day; a holiday
December	1	Thursday	State Day Convocation
December	15	Thursday	Senate meeting, 4:30 p.m.
December	17 & 19-23		Final examination period
December	22	Thursday	Commencement Convocation
December	23	Friday	Fall quarter ends, 6:00 p.m.
December	31	Saturday	Payment of fees closes at 12 m. for all students in residence fall quarter ³

1933		<i>Winter Quarter</i>	
January	6	Friday	Entrance tests
January	6-7		Registration days ¹ for new students in all colleges except the College of Engineering and Architecture and the School of Chemistry
			Payment of fees for new students closes
			Registration and payment of fees close at 12 m. on January 7
January	9	Monday	Winter quarter classes begin, 8:30 a.m. ²
February	14	Tuesday	Mid-quarter grades due

See footnotes on page 4.

February	16	Thursday	Charter Day Convocation Senate meeting, 4:30 p.m.
February	22	Wednesday	Washington's Birthday; a holiday (except for extension)
March	20-25		Final examination period
March	23	Thursday	Commencement Convocation Payment of fees closes for all students ³ in residence winter quarter
March	25	Saturday	Winter quarter ends, 6:00 p.m.

Spring Quarter

March	31	Friday	Entrance tests
March 31 & April 1			Registration days ¹ for new students in all colleges except the College of Engineering and Architecture and the School of Chemistry Payment of fees for new students closes Registration and payment of fees close at 12 m. on April 1
April	3	Monday	Spring quarter classes begin, 8:30 a.m. ²
April	14	Friday	Good Friday; a holiday (except for extension)
May	10	Wednesday	Mid-quarter grades due
May	11	Thursday	Cap and Gown Day Convocation
May	18	Thursday	Senate meeting, 4:30 p.m.
May	30	Tuesday	Memorial Day; a holiday
June	10&13-17		Final examination period
June	11	Sunday	Baccalaureate service
June	12	Monday	Sixty-first annual commencement
June	17	Saturday	Spring quarter closes, 6:00 p.m.

Summer Quarter

June	19-20		Registration, first term
June	21	Wednesday	Summer quarter classes begin, 8:00 a.m.
July	4	Tuesday	Independence Day; a holiday
July	27	Thursday	Commencement Convocation
July	29	Saturday	Registration and payment of fees for second term closes at 12 m.
July	31	Monday	Second term classes begin, 8:00 a.m.
September	2	Saturday	Second term closes

¹ Registration subsequent to the date specified will necessitate the approval of the college concerned. See also penalty fees for late registration, page 52, bulletin of general information. No student will be allowed to register in the University after one week from the beginning of the quarter excepting in unusual cases wherein special circumstances shall justify the appropriate committee of the college concerned permitting registration at a later date.

² First hour classes begin at 8:15 a.m. at University Farm.

³ New students must pay fees on dates announced for registration.

THE COURSES OF STUDY

GENERAL REQUIREMENTS

To be eligible for admission to the School of Business Administration, the student must present ninety (90) credits, in addition to credits given for physical education, earned in a recognized college or university with one honor point per credit or a smaller number of earned credits which, together with quality credits, will total a minimum of ninety (90). One quality credit is granted for every five honor points in excess of one honor point per credit.

Quality credits earned in the Lower Division may be applied only toward the ninety credits required for admission to the School of Business Administration. In other words, a student who has a surplus of honor points above the number required to complete ninety credits may not apply these for credit in the School of Business Administration. Any excess credits, however, other than quality credits, may be applied toward electives in the School of Business Administration.

The credits for admission shall be earned in the following groups:

A. Required Credits:

1. Freshman Composition (Comp. 4-5-6), Freshman English (Eng. A-B-C), or exemption from requirement.
2. Ten credits in mathematics or *one* of the following laboratory sciences: botany, chemistry, physics, zoology.
3. Ten credits in *one* of the following social sciences: geography, history, political science, sociology.¹
4. Ten credits in the Principles of Economics. (This requirement may be satisfied by the completion of Economics 6 and 7 or the equivalent. The student will consult a pre-business adviser concerning an equivalent.)

B. Elective Credits:

Sufficient elective credits to complete the minimum number required for admission (normally fifty-four (54) credits). The attention of the student is called to the two following groups of subjects to which part of the elective time should be devoted:

1. Courses required for graduation from the School of Business Administration and recommended for pre-business students. These courses are prerequisites for certain required courses in the School of Business Administration:

Economics 3, (Mechanism of Exchange)

Economics 14, (Elements of Statistics)²

Economics 25-26, (Principles of Accounting)³

Students who do not elect the above courses during the freshman and sophomore years will be required to take Business Administration 57, 62, and 70, during the first quarter in residence in the School of Business Administration.

¹ Sociology 45 is not accepted in fulfillment of the social science requirement.

² Credit will not be given in Economics 14 to students who have had Sociology 45.

³ Students who have had a high school course or experience in bookkeeping will be admitted to Economics 25 upon passing a placement test. For other students Economics 20 is prerequisite to Economics 25.

2. Courses required as prerequisites to courses in certain sequences in the School of Business Administration and recommended for all students:
- a. Psychology 1-2, (General Psychology). This course is a prerequisite for courses in Advertising, Foreign Trade, Merchandising, Personnel Management, and Insurance.
 - b. Mathematics 8 and 20. (Commerce Algebra and Mathematics of Investment.)
Required of students who take the Accounting, Insurance, or Finance sequence.
 - c. Mathematics 8 and 6, Commerce Algebra and Trigonometry, are required of students who take the Statistics sequence.
 - d. Students in the Foreign Trade sequence are required to have a reading knowledge of at least one foreign language.

In the School of Business Administration stress is laid upon the adaptation of the curriculum to the future plans of the individual. In order to make this aim effective each student is assigned to an adviser who makes a study of his needs and helps him to frame a program which will most nearly meet them.

In connection with some of the programs of study, provision has been made for employment with business concerns. The student is employed full time for one term in an accounting office, a bank, trust company, or other business institution. On completion of a satisfactory report concerning his work he may be granted a maximum of three credits. This work is organized for the purpose of providing proper laboratory facilities in business practice.

THE CORE GROUP

The following courses constitute a core of material which should be covered by all students. In addition to these courses, there are certain required subjects in the various sequences. Unless an exception is specifically noted in connection with a sequence, all courses listed in this group will be required.

Exceptions may be made in individual cases upon petition approved by the adviser and the chairman of the Students' Work Committee.

JUNIOR YEAR

	Credits
Business Law (B. A. 51, 52, 53).....	9
Money and Banking—Advanced Course (B. A. 142).....	3
Advanced General Accounting (B. A. 139).....	3
Corporation Finance (B. A. 155).....	3
Survey of Marketing (B. A. 77 ¹).....	3
Traffic Management (B. A. 71).....	3
Business Statistics (B. A. 112).....	3
Report Writing (B. A. 100).....	1
Production Management (B. A. 89).....	3
	—
	31

¹ Required of those who have not received credit in Economics 1B, Business Organization—Marketing.

SENIOR YEAR

	Credits
Advanced General Economics (B. A. 101-102).....	6
Labor Problems (Econ. 161).....	3
Public Finance (B. A. 58).....	3
Economics of Public Utilities (B. A. 165).....	3
	<hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 15

COMPREHENSIVE EXAMINATION¹

Candidates for the degree of bachelor of business administration from the School of Business Administration are required to pass a comprehensive examination covering the content of the core group of courses. This examination will usually be taken in the final quarter of residence.

I. THE GENERAL BUSINESS SEQUENCE

Advisers, Mr. Mudgett, Mr. Cassady, Mr. Stead, and Mr. Schmidt

The sequence is recommended to those persons who desire a well-balanced training in the important fields of business education, or for those who have not decided upon a specialized field of study. The sequence includes the courses required of all juniors and seniors in the School of Business Administration (see Core Group above) and, in addition, Geography 41, Geography of Commercial Production (to be taken preferably in the junior year); Business Administration 130, Cost Accounting Survey; Business Administration 109, Business Policy; and Economics 149, Business Cycles.

A student taking his degree in the general business sequence has available a considerably wider range of electives than is the case in the specialized sequences given hereafter. These electives offer to the student the opportunity of pursuing an interest in fields associated with his general training, in the social or natural sciences, or in the arts. It is desirable that sufficient electives be taken in a given field to familiarize the student with something more than an introductory course. The following are suggested as fields for election and the courses within these fields may be arranged to meet the needs of individual students:

Anthropology	Journalism
Botany	Mathematics
Economics and Business Administration	Philosophy
English Literature, Composition, Speech	Political Science
Geography	Psychology
Geology and Mineralogy	Sociology
Modern Foreign Languages	Zoology
History	

¹ Required of all candidates entering in the fall quarter, 1932, and subsequent thereto.

II. ACCOUNTING

Advisers, Mr. Heilman, Mr. Reighard, and Mr. Alm

The program in accounting is designed to meet the needs of those persons who are preparing for public accounting, the teaching of accounting, or for positions as accountants in financial or business establishments. Students in this sequence are not required to take B. A. 139.

JUNIOR YEAR

	Credits
Core group requirements	28
Cost Accounting (B. A. 132).....	5
Accounting Practice and Procedure (B. A. 138).....	5
Accounting Practice Laboratory (B. A. 92).....	1
Electives	6
	—
	45

SENIOR YEAR

	Credits
Core group requirements	15
Auditing and Public Accounting (B. A. 135).....	3
Business Cycles (Econ. 149).....	3
Business Policy (B. A. 109).....	3
Three of the following:	
Cost Accounting Methods (B. A. 133)	
Income Tax Accounting (B. A. 134)	
Internal Auditing (B. A. 136)	
Senior Topics Course—Accounting (B. A. 181-182A)	
Senior Practice Course (B. A. 183)	
	} 9
Electives	12
	—
	45

RECOMMENDED ELECTIVES

	Credits
Income Tax Accounting.....	3
Internal Auditing	3
Senior Topics Course—Accounting	3
Senior Practice Course	3
Cost Accounting Methods.....	3
Finance Management	3
Personnel Administration	3
Commercial Policies	3
Fire and Marine Insurance.....	3
Casualty Insurance	3
Government and Business.....	3
Office Management	3
Investments	3
Theory of Statistics	6
Economic History	3 to 9

III. ADVERTISING

Adviser, Mr. Vaile

The program in advertising is designed to prepare students for work either in advertising agencies or in advertising departments of merchandising establishments and of newspapers. Preliminary training is given in

commercial art. Special emphasis is placed on the use of advertising in constructive merchandising. For those especially interested in copy writing, additional work in English composition is recommended. For those especially interested in illustration and layout, work in freehand drawing is recommended. For those interested in department store advertising, the courses in textiles and in color and design are recommended.

Psychology 1 and 2 are Lower Division prerequisites for this sequence.

JUNIOR YEAR

	Credits
Core group requirements.....	31
Psychology of Advertising (Psy. 56).....	3
Advertising (B. A. 88).....	3
Introduction to Reporting (Jour. 13) ¹	3
Editing for Non-Majors (Jour. 41).....	3
Newspaper and Magazine Articles (Jour. 69).....	3
Electives	0
	—
	46

SENIOR YEAR

	Credits
Core group requirements	15
Graphic Arts (Draw. and Desc. Geom. 64-65-66).....	6
Advanced Advertising Procedure (B. A. 194-195-196).....	3
Senior Topics Course—Marketing (B. A. 182C).....	3
Advertising and Newspaper Typography (Jour. 55).....	3
Electives	14
	—
	44

RECOMMENDED ELECTIVES²

	Credits
Senior Topics Course—Marketing	6
Types of Writing	6
Social Psychology	3
Freehand Drawing	6
Principles of Harmony in Form and Color.....	3
Sales Management	3
Public Speaking	6
Textiles	3
Color and Design	3

IV. AGRICULTURAL BUSINESS

Adviser, Mr. Jesness

This line of specialization is intended for students who wish to prepare for some branch of business which relates to agriculture, such as the marketing of farm products, farm finance, farm implements, farm real estate, country merchandising, and the like. The student should also take supplementary courses in technical agriculture. It is recommended that as many as possible of these be taken during the pre-business years. During

¹ To be taken in the sophomore year when possible.

² Permission may be obtained by individual students to substitute one from this list of electives for Production Management in the core group.

the junior and senior years students in this sequence are registered jointly in the College of Agriculture, Forestry, and Home Economics and the School of Business Administration. One hundred ninety-two credits are required for graduation from this course.

JUNIOR YEAR

Substitutions may be made for Corporation Finance (B. A. 155), Survey of Marketing (B. A. 77), Production Management (B. A. 89), and Business Statistics (B. A. 112) in the core group requirements for students in this sequence.

	Credits
Core group requirements.....	19
Economics of Agricultural Production (Ag. Econ. 110-111)....	6
Principles of Marketing Organization (Ag. Econ. 40-141-142)...	8
Prices of Farm Products (Ag. Econ. 30).....	3
Market Prices (Ag. Econ. 131).....	3
Electives	6
	—
	45

SENIOR YEAR

Substitutions may be made for Labor Problems (Econ. 161) and Economics of Public Utilities (B. A. 165) in the core group requirements for students in this sequence.

	Credits
Core group requirements	9
Agricultural Statistics (Ag. Econ. 90).....	5
Advanced Agricultural Statistics (Ag. Econ. 191).....	3
Methods of Price Analysis (Ag. Econ. 135).....	3
Advanced Farm Finance (Ag. Econ. 150).....	3
Land Economics (Ag. Econ. 170).....	3
Business Cycles (Econ. 149).....	3
Electives	16
	—
	45

RECOMMENDED ELECTIVES

A. Economics

	Credits
Business Statistics	3
Corporation Finance	3
Commercial Policies	3
Co-operative Organization	3
Business Policy	3
Labor Problems	3
Farm Management Organization	3
Farm Management Operation	3

B. Agriculture

The following courses are suggested for students who wish to prepare for business related to certain aspects of agriculture. Students interested in other specializations should consult their adviser.

1. Dairy Products
 - Agricultural Biochemistry
 - General Bacteriology
 - Dairy Bacteriology
 - Dairy Products
 - Market Milk
2. Grain and Hay
 - Forage Crops
 - Grain Crops
 - Grain and Hay Grading
3. Seeds. These courses are in addition to those under 2.
 - Principles of Genetics
 - Farm Crops
 - Special Crops
 - Plant Breeding
4. Agricultural Implements
 - General Physics
 - Agricultural Physics
 - Farm Machinery
 - Mechanical Training
 - Auto and Tractor

V. FINANCE

Adviser, Mr. Stehman

This program of courses is designed to meet the needs of persons who will ultimately secure connections with financial institutions such as banks and bond houses or with the financial departments of other concerns.

JUNIOR YEAR

	Credits
Core group requirements.....	31
Electives	14
	45

SENIOR YEAR

	Credits
Core group requirements	15
Finance Management (B. A. 156).....	3
Bank Administration (B. A. 147).....	3
Investments (B. A. 146).....	3
Foreign Exchange (B. A. 145).....	3
Senior Topics Course—Finance (B. A. 181-182B).....	6
Comparative Banking—British Systems (Econ. 124).....	3
Business Cycles (Econ. 149).....	3
Electives	6
	45

RECOMMENDED ELECTIVES

	Credits
Economic History	3 to 6
Advanced Farm Finance	3
Comparative Banking—European Systems.....	3
Comparative Banking—South American Systems.....	3
Cost Accounting Survey	3
State and Local Taxation.....	3
Commercial Policies	3
Geography	5 to 9

	Credits
Life Insurance	3
Personnel Administration	3
Accounting Practice and Procedure.....	5
Fire and Marine Insurance.....	3
Casualty Insurance	3

VI. FOREIGN TRADE

Adviser, Mr. Blakey

This sequence is designed for persons who plan to associate themselves with exporting houses or with export departments of large manufacturing and mercantile establishments. Students following this sequence must have a reading knowledge of at least one foreign language.

JUNIOR YEAR

	Credits
Core group requirements	31
Geography of Commercial Production (Geog. 41).....	5
Foreign Exchange (B. A. 145).....	3
Advertising (B. A. 88).....	3
Electives	3
	—
	45

SENIOR YEAR

	Credits
Core group requirements	15
Commercial Policies (Econ. 176).....	3
Foreign Trade (B. A. 177).....	3
International Law (Pol. Sci. 181-182).....	6
Business Cycles (Econ. 149).....	3
Electives	15
	—
	45

RECOMMENDED ELECTIVES

	Credits
A senior topics course.....	3 to 9
Finance Management	3
Economic History	3 to 6
Foreign Languages	
Comparative European Government.....	5
Personnel Administration	3
Advanced Personnel Administration.....	3
Economics of Agricultural Production.....	3
Fire and Marine Insurance.....	3
Advanced English Composition.....	9
Transportation Charges	3
Transportation Law	3

VII. PERSONNEL MANAGEMENT

Adviser, Mr. Stead

This program offers basic training to (1) prospective workers in personnel departments of business establishments, and (2) to persons who expect to participate in the adjustment of matters pertaining to the employment of labor.

COURSES OF STUDY

JUNIOR YEAR

	Credits
Core group requirements	31
Labor Movements (Econ. 162).....	3
Personnel Administration (B. A. 167).....	3
Advanced Personnel Administration (B. A. 168).....	3
Electives	5
	—
	45

SENIOR YEAR

	Credits
Core group requirements	15
Labor Legislation and Social Insurance (Econ. 164).....	3
Psychology in Personnel Work (Psy. 160).....	3
Vocational Psychology (Psy. 130).....	2
Senior Topics Course—Personnel (B. A. 180-181-182D).....	9
Psychology of Individual Differences (Psy. 125-126).....	6
Electives	7
	—
	45

RECOMMENDED ELECTIVES

	Credits
Casualty Insurance	3
Introduction to Administration	3
Principles of Public Administration.....	3
Economic History	3 to 6
Introduction to Anthropology.....	5
Introduction to Sociology	5
Advanced English Composition.....	9
Theory of Statistics	6
Office Management	3

VIII. MERCHANDISING

Adviser, Mr. Vaile

This sequence is designed to prepare the student for work in the merchandising department either of manufacturing, wholesaling, or retailing establishments.

Psychology 1 and 2 are Lower Division prerequisites for this sequence.

B. A. 183 may be substituted for either 181 or 182 by permission of the adviser.

JUNIOR YEAR

	Credits
Core group requirements	31
Psychology of Advertising (Psy. 56).....	3
Advertising (B. A. 88).....	3
One of the following:	
Sales Management (B. A. 68) }	3
Retailing (B. A. 69) }	
Electives	5
	—
	45

SENIOR YEAR

	Credits
Core group requirements	15
Senior Topics Course—Marketing (B. A. 180-181-182C).....	9
Transportation Charges (B. A. 73).....	3
Commercial Policies (Econ. 176).....	3
Business Cycles (Econ. 149).....	3
Electives	12
	—
	45

RECOMMENDED ELECTIVES

	Credits
Types of Writing.....	6
Geography of Commercial Production.....	5
Foreign Trade	3
Transportation Services	3
Textiles	3
Personnel Administration	3
Government and Business.....	3
Fire and Marine Insurance.....	3

IX. SECRETARIAL

Adviser, Miss Donaldson

The courses offered in this program are arranged for the training of secretaries and assistants. The student should select, with the help of his adviser, the courses which will best prepare him for the special type of secretarial work he expects to enter. Among the positions for which he may prepare are the following: office manager and assistant; private secretary to persons engaged in educational, social, philanthropic, scientific, medical, legal, religious, literary, professional, or mercantile work; secretary in schools and institutions; business correspondent; civil service.

Econ. 32, Secretarial Training—Typewriting is a Lower Division prerequisite for this sequence.

JUNIOR YEAR

	Credits
Core group requirements	31
Types of Writing (Comp. 18-19).....	6
Secretarial Training—Shorthand (Econ. 37-38-39).....	9
Secretarial Training—Typewriting (Econ. 33).....	1
Electives	0
	—
	47

SENIOR YEAR

	Credits
Core group requirements	15
Office Organization and Management (B. A. 86).....	3
Secretarial Procedure (Econ. 40-41-42).....	9
Secretarial Training—Typewriting (Econ. 34).....	1
Senior Topics Course—Secretarial (B. A. 181-182E).....	6
Electives	9
	—
	43

RECOMMENDED ELECTIVES

	Credits
Life Insurance	3
Advertising	3
Investments	3
Economic History	3 to 6
Cost Accounting	3
Personnel Administration	3
Geography of Commercial Production.....	5
Government and Business.....	3
Public Speaking	5 to 10
Psychology in Personnel Work.....	3
Psychology of Advertising	3
Business Cycles	3
Sociology	5

X. INDUSTRIAL ADMINISTRATION

Adviser, Mr. Filipetti

The sequence follows the two-year pre-business curriculum given in the College of Engineering and Architecture. The program is designed primarily for students who expect to engage in purchasing, sales, employment, production, control, or cost accounting work in manufacturing establishments.

JUNIOR YEAR

	Credits
Core group requirements	31
Strength of Materials (M. & M. 85).....	4
Principles of Accounting (Econ. 26).....	3
Electives	7
	—
	45

SENIOR YEAR

	Credits
Core group requirements	15
Cost Accounting Survey (B. A. 130).....	3
Personnel Administration (B. A. 167).....	3
Senior Topics Course—Production Management (B. A. 180-181-182G)	9
Business Cycles (Econ. 149).....	3
Electives	12
	—
	45

RECOMMENDED ELECTIVES

The students may divide the time available for electives between Groups A and B.

A. General and Business

	Credits
Economic History	3 to 6
Finance Management	3
Theory of Statistics	6
Geography of Commercial Production.....	5
Casualty Insurance	3
Fire and Marine Insurance.....	3

B. Engineering

	Credits
Gas Manufacture and Distribution.....	3
Municipal Engineering	3
Contracts and Specifications.....	3
Estimating	3
Technical Writing	3

XI. STATISTICS*

Adviser, Mr. Mudgett

This sequence is designed for students who intend to become statisticians for business firms or associations. The student will be required to take the core courses required of all juniors and seniors in the School of Business Administration with the exception of Labor Problems (Econ. 161), Production Management (B. A. 89), and Traffic Management (B. A. 71), for which suitable courses in mathematics may be substituted. The Statistics sequence therefore shall include the following:

JUNIOR YEAR

	Credits
Core group requirements.....	25
Theory of Statistics (Econ. 113-114).....	6
Analytic Geometry (Math. 30).....	5
Investments (B. A. 146).....	3
Electives	6
	—
	45

SENIOR YEAR

	Credits
Core group requirements	12
Senior Topics Course—Statistics (B. A. 180-181-182F).....	6 to 9
Cost Accounting (B. A. 130).....	3
Calculus I and II (Math. 50-51).....	10
Business Cycles (Econ. 149).....	3
Electives	8-11
	—
	45

RECOMMENDED ELECTIVES

	Credits
Calculus III	5
Mathematical Theory of Statistics.....	9
Logic	5
Foreign Exchange	3
History of Economic Ideas.....	3

It is advisable, wherever possible, for the student who intends to take the Statistics sequence, to take Mathematics 30 during the sophomore year, thereby giving opportunity to take Mathematics 50-51 as a junior and either Advanced Calculus or Mathematical Theory of Statistics as a senior.

XII. TRAFFIC AND TRANSPORTATION

This sequence is designed for those persons who wish to prepare for traffic work with shippers and carriers. A sufficient number of general

courses are included to meet the needs of those who expect to obtain executive positions involving only an incidental amount of traffic work.

JUNIOR YEAR

	Credits
Core group requirements	31
Geography of Commercial Production (Geog. 41).....	5
Trade Routes and Trade Centers (Geog. 102).....	3
Foreign Trade (B. A. 177).....	3
Sales Management (B. A. 68).....	3
Transportation Services (B. A. 72).....	3
	—
	48

SENIOR YEAR

	Credits
Core group requirements	15
Transportation Charges (B. A. 73).....	3
Traffic Law (B. A. 74).....	3
Cost Accounting Survey (B. A. 130).....	3
Fire and Marine Insurance (B. A. 60).....	3
Senior Topics Course—Traffic Management (B. A. 182 I)....	3
Electives	12
	—
	42

RECOMMENDED ELECTIVES

	Credits
Office Management (B. A. 86).....	3
Personnel Administration (B. A. 167).....	3

XIII. INSURANCE

Adviser, Mr. Graves

This sequence is recommended to those who expect to enter one of the several branches of the insurance business or who plan to associate themselves with insurance departments of banking, commercial, or industrial organizations. The courses offered provide adequate academic preparation for those who plan to take the examination for the degree of chartered life underwriter, which is granted to those who satisfy the requirements of the American College of Life Underwriters.

JUNIOR YEAR

	Credits
Core group requirements	31
Life Insurance (B. A. 59).....	3
Fire and Marine Insurance (B. A. 60).....	3
Advertising (B. A. 88).....	3
Psychology of Advertising (Psy. 56).....	3
Electives	2
	—
	45

SENIOR YEAR

	Credits
Core group requirements	15
Casualty Insurance (B. A. 61).....	3
Investments (B. A. 146).....	3
The Securities Market (B. A. 148).....	3
Elements of the Mathematics of Life Insurance (Math. 21).....	3
Senior Topics Course—Insurance (B. A. 182H).....	3
Business Cycles (Econ. 149).....	3
Electives	12
	—
	45

RECOMMENDED ELECTIVES

	Credits
Social Psychology	3
Sales Management	3
State and Local Taxation.....	3
Economic History	6
Government and Business	3
Personnel Administration	3
Introduction to Sociology.....	5
Recent Social Legislation.....	3

PROGRAM*
ECONOMICS

No.	Title	Hour	Day	Bldg.	Instructor
1Af	Business Organization: Production... (5 cred.; fr. only; no prereq.)				
	Lect.	IV	T	BuAud	Mr. Stevenson,
	Sec. 1	I	MWFS	15F	Mr. Borak,
	2	I	MWFS	206Pt	and others
	3	II	MWFS	15F	
	4	II	MWFS	3F	
	5	II	MWFS	5F	
	6	III	MWFS	15F	
	7	III	MWFS	3F	
	8	IV	MWFS	15F	
	9	IV	MWFS	2J	
	10	V	MTWF	102B	
	11	V	MTWF	6B	
	12	VI	MWThF	206Pt	
	13	VI	MWThF	2J	
	14	VII	MWThF	202B	
	15	VII	MWThF	303B	
	16	VIII	MWThF	303B	
1Aw	Business Organization: Production... (See 1Af)				
	Lect.	IV	T	133Ph	Mr. Stevenson,
	Sec. 1	II	MWFS	303B	Mr. Borak,
	2	V	MTWF	209B	and others
	3	VII	MWThF	6B	
1Bw	Business Organization: Marketing.... (5 cred.; fr. only; ‡ no prereq.)				
	Lect.	IV	TS	BuAud	Mr. Vaile
	Sec. 1	I	MWF	15F	and others
	2	I	TThS	302B	
	3	II	MWF	15F	
	4	II	TThS	302B	
	5	III	MWF	15F	
	6	III	TThS	15F	
	7	IV	MWF	302B	
	8	IV	MWF	15F	
	9	V	MWF	6B	
	10	VI	MWF	15F	
	11	VI	MWF	210P	
	12	VII	MWF	209B	
	13	VIII	MWF	6B	

* Each course has in parentheses an abbreviated statement of credits and prerequisites. Thus (5 cred.; jr., sr., grad.; prereq., 3-4) means that the course carries 5 credits, is offered to juniors, seniors, and graduates, and demands Course 3-4 in the same department as a prerequisite.

‡ Sophomores who have credit for 1A may elect Courses 1B, 3, and 4.

SCHOOL OF BUSINESS ADMINISTRATION

No.	Title	Hour	Day	Bldg.	Instructor
1Bs	Business Organization: Marketing.... (See 1Bf)				
	Lect.	V	TS	301F	Mr. Vaile
	Sec. 1	I	TThS	6B	and others
	2	I	MWF	15F	
	3	V	MWF	301B	
	4	VI	MWF	302B	
3w	The Mechanism of Exchange..... (5 cred.; 3rd qtr. fr., soph., jr., sr. no prereq.)				
	Lect.	III	TTh	BuAud	Mr. Stehman
	Sec. 1	I	TThS	15F	and others
	2	II	MWF	6B	
	3	III	MWF	3F	
	4	IV	MWF	2J	
	5	V	MWF	202B	
	6	VI	MWF	206Pt	
3s	The Mechanism of Exchange..... (See 3w)				
	Lect.	III	TTh	BuAud	Mr. Stehman
	Sec. 1	I	MWF	2F	and others
	2	I	TThS	302B	
	3	II	MWF	6B	
	4	II	TThS	6B	
	5	III	MWF	209B	
	6	IV	MWF	112Bu	
	7	IV	MWF	2F	
	8	V	MWF	303B	
	9	V	MWF	6B	
	10	VI	MWF	15F	
	11	VI	MWF	112Bu	
	12	VII	MWF	102B	
	13	VII	MWF	6B	
	14	VIII	MWF	102B	
4f	Principles of Economics..... (5 cred.; soph.; prereq., 1A, 1B and 3)				
	Lect.	II	Th	JAud	Mr. Marget,
	Sec. 1	I	TThFS	3F	Mr. Borak,
	2	II	MWFS	6F	and others
	3	III	TThFS	6F	
	4	IV	MWFS	6F	
	5	V	MTWF	202B	
	6	VII	MWThF	6B	
4w	Principles of Economics..... (See 4f)	II	MTThFS	3F	Mr. Borak and others
4s	Principles of Economics..... (See 4f)				
	Lect.	II	Th	206Pt	Mr. Marget,
	Sec. 1	II	MWFS	15F	Mr. Borak,
	2	V	MTWF	202B	and others

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
6f-7w†§	Principles of Economics — General Course (10 cred.; soph., jr., sr.; no prereq.; not open to students who have received credit in Econ. 4 or in Econ. 1A)				
	Lect.	III	W	JAud	Mr. Marget,
	Sec. 1	I	TThFS	5F	Mr. Borak,
	2	II	MWFS	9F	and others
	3	III	TThFS	9F	
	4	V	MTWF	301B	
	5	VI	MWThF	9F	
	6 (Fall only)	VII	MWThF	15F	
6w-7s†§	Principles of Economics — General Course (See 6f-7w)				
	Lect.	II	T	JAud	Mr. Marget,
	Sec. 1	II	MWFS	5F	Mr. Borak,
	2	IV	MWFS	9F	and others
	3	V	MTWF	102B	
	4	VI	MWThF	6F	
14f*	Elements of Statistics (5 cred.; soph., jr., sr.; prereq., 4 or 6-7)				
	Sec. 1	I	MWThFS	125F	Mr. Mudgett,
	2	III	MTWFS	303B	Mr. Kozelka,
	3	IV	MTWFS	104F	and others
	4	VI	MTWThF	6B	
14w*	Elements of Statistics (See 14f)				
	Sec. 1	III	MTWFS	5F	Mr. Mudgett,
	2	IV	MTWFS	124F	Mr. Kozelka,
	3	VI	MTWThF	102B	and others
	4	VII	MTWThF	303B	
14s*	Elements of Statistics (See 14f)				
	Sec. 1	I	MWThFS	15F	Mr. Mudgett,
	2	II	MWThFS	3F	Mr. Kozelka,
	3	III	MTWFS	2F	and others
	4	IV	MTWFS	209B	
	5	VI	MTWThF	2F	
20f*	Elements of Accounting (3 cred.; 3rd qtr. fr., soph.; no prereq.)				
	Sec. 1	I	MWF	303B	Mr. Heilman
	2	I	TThS	302B	and others
	3	II	MWF	111Bu	
	4	II	TThS	4J	
	5	III	MWF	302B	
	6	III	TThS	302B	
	7	V	MWF	302B	
	8	VI	MWF	302B	
	9	VII	MWF	302B	

* Pre-business students may not receive credit for both Economics 14 and Sociology 45.

† The entire course must be completed before credit is received for any quarter.

§ Students entering with advanced standing in Economics 6 must consult department adviser as to a continuation course.

SCHOOL OF BUSINESS ADMINISTRATION

No.	Title	Hour	Day	Bldg.	Instructor
20w*	Elements of Accounting..... (See 20f)				
	Sec. 1	I	TThS	303B	Mr. Heilman
	2	III	TThS	303B	and others
	3	III	MWF	301B	
	4	VI	MWF	6B	
20s*	Elements of Accounting..... (See 20f)				
	Sec. 1	I	MWF	303B	Mr. Heilman
	2	I	TThS	301B	and others
	3	III	TThS	301B	
	4	IV	MWF	303B	
	5	VI	MWF	303B	
	6	VII	MWF	303B	
25f-26w††	Principles of Accounting..... (6 cred.; soph., jr., sr.; prereq., 20)				
	Sec. 1	I	TThS	301B	Mr. Heilman
	2	III	TThS	301B	and others
	3 (Fall only)	IV	MWF	301B	
	4	VI	MWF	303B	
25w-26s††	Principles of Accounting..... (See 25f-26w)				
	Sec. 1	I	MWF	302B	Mr. Heilman
	2	II	MWF	301B	and others
	3	II	TThS	301B	
	4	III	MWF	303B	
	5	IV	MWF	301B	
	6	VI	MWF	301B	
25s††	Principles of Accounting..... (1st qtr. of 25-26. See 25f-26w)				
	Sec. 1	II	MWF	303B	Mr. Heilman
	2	III	TThS	303B	and others
	3	V	MWF	302B	
26f††	Principles of Accounting..... (2nd qtr. of 25-26. See 25f-26w)				
	Sec. 1	II	TThS	302B	Mr. Heilman
	2	IV	MWF	302B	and others
32f-33w- 34s††§	Secretarial Training: Typewriting.... (3 cred.; 3rd qtr. fr., soph., jr.; pre- req., consent of instructor)	III V	TThS MW	1B 1B	Miss Donaldson and others
32s†§	Secretarial Training: Typewriting.... (1st qtr. of 32-33-34. See 32f-33w- 34s)	IV	MTWFS	1B	Miss Donaldson and others
33f†§	Secretarial Training: Typewriting.... (2nd qtr. of 32-33-34. See 32f-33w- 34s)	VI	MTWThF	1B	Miss Donaldson and others
34w†§	Secretarial Training: Typewriting.... (3rd qtr. of 32-33-34. See 32f-33w- 34s)	VI	MTWThF	1B	Miss Donaldson and others

* Students who have had high school training or other experience in bookkeeping and who pass the placement test may be exempt from this course and admitted to Economics 25.

† The entire course must be completed before credit is received for any quarter.

‡ Open to pre-business students only.

§ Open for credit to pre-secretarial and pre-commercial education students only.

§ A laboratory fee of \$2.50 will be required of students who register for one or more of the courses in secretarial training.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
37f-38w- 39s*†§	Secretarial Training: Shorthand..... (9 cred.; soph., jr.; prereq., 32 or consent of instructor)				
	Rec.	II	TThS	311F	Miss Donaldson
	Lab. Sec. 1	I	MWF	1B	and others
	2	II	MWF	1B	
40f-41w- 42s*†§	Secretarial Procedure (9 cred.; soph., jr., sr.; prereq., 33, 39 or consent of instructor)				
	Rec.	I	MWF	301F	Miss Donaldson
	Lab. Sec. Tr.	V	TThF	1B	
	Com'l Ed.	VII	TThF	1B	
90f	Accounting Laboratory for Commercial Teachers (1 cred.; jr., sr.; prereq., 25; open to secretarial training and commercial education students only)	VI-VII	M	301B	Mr. Heilman
105	History of Economic Ideas—The Classical Economists (3 cred.; jr., sr., grad.; prereq., 101-102 or 103-104 or consent of instructor)	Not offered			
106s	History of Economic Ideas—The Critics of the Classical Economists.... (3 cred.; jr., sr., grad.; prereq., 101-102 or 103-104 or consent of instructor)	VII	MWF	102B	Mr. Hansen
113w-114s	Theory of Statistics..... (6 cred.; jr., sr., grad.; prereq., 14)	I	MWF	102B	Mr. Mudgett
124w	Comparative Banking—British Systems (3 cred.; jr., sr., grad.; prereq., 141 or B. A. 142)	III	MWF	6B	Mr. Myers
125s	Comparative Banking—European Systems (3 cred.; jr., sr., grad.; prereq., 141 or B. A. 142)	II	MWF	209B	Mr. Myers
127	Comparative Banking—South American Systems (3 cred.; jr., sr., grad.; prereq., 141 or B. A. 142)	Not offered			
149f	Business Cycles (3 cred.; sr., grad.; prereq., 141 or B. A. 142)	I	TThS	202B	Mr. Marget
149w	Business Cycles (See 149f)				
	Sec. 1	I	MWF	209B	Mr. Marget
	2	VII	MWF	102B	Mr. Myers
149s	Business Cycles (See 149f)	III	MWF	102B	Mr. Marget

* Open for credit to pre-secretarial and pre-commercial education students only.

† The entire course must be completed before credit is received for any quarter.

§ A laboratory fee of \$2.50 will be required of students who register for one or more of the courses in secretarial training.

SCHOOL OF BUSINESS ADMINISTRATION

No.	Title	Hour	Day	Bldg.	Instructor
161f	Labor Problems and Trade Unionism (3 cred.; jr., sr., grad.; prereq., 4 or 6-7)	IV	MWF	202B	Mr. Hansen
161w	Labor Problems and Trade Unionism (See 161f)	III	TThS	209B	Mr. Stead
161s	Labor Problems and Trade Unionism (See 161f)	III	TThS	102B	Mr. Hansen
162w	Labor Movements	IV	MWF	202B	Mr. Hansen
163w	Economic Aspects of Population and Immigration	III	TThS	102B	Mr. Hansen
164s	Labor Legislation and Social Insurance	III	TThS	209B	Mr. Stead
166f	International Economic Problems.... (3 cred.; jr., sr., grad.; prereq., 4 or 6-7)	VII	MWF	102B	Mr. Hansen
176f	Commercial Policies	I	MWF	202B	Mr. Blakey
176s	Commercial Policies	I	MWF	202B	Mr. Blakey
191f-192w†§	Public Finance	III	MWF	209B	Mr. Blakey
193s	State and Local Taxation..... (3 cred.; jr., sr., grad.; prereq., 191-192)	III	MWF	6B	Mr. Blakey

BUSINESS ADMINISTRATION

No.	Title	Hour	Day	Bldg.	Instructor
51f*	Business Law: Contracts				
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
	Lect.	IV	T	JAud	Mr. Dalzell
	Sec. 1	I	ThS	301F	
	2	II	ThS	301F	
	3	III	ThS	301F	
51s*	Business Law: Contracts	V	MWF	209B	Mr. Dalzell
	(See 51f)				
52w*	Business Law; Agency, Partnership and Corporations				
	(3 cred.; jr., sr.; prereq., 51)				
	Lect.	IV	T	JAud	Mr. Dalzell
	Sec. 1	I	ThS	301F	
	2	II	ThS	301F	
	3	III	ThS	301F	
53s*	Business Law: Negotiable Instruments (3 cred.; jr., sr.; prereq., 51)				
	Lect.	IV	T	JAud	Mr. Dalzell
	Sec. 1	I	ThS	301F	
	2	II	ThS	301F	
	3	III	ThS	301F	

* No credit will be allowed for B. A. 51, 52, or 53 until all three are completed.

† The entire course must be completed before credit is received for any quarter.

§ Credit may not be received for both Economics 191-192 and B. A. 58.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
57f†	Money and Banking.....	III	MTThFS	6B	Mr. Stehman
	(5 cred.; jr., sr.; no prereq.)				
58f§	Elements of Public Finance.....	IV	MWF	209B	Mr. Blakey
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
58w§	Elements of Public Finance.....	II	MWF	209B	Mr. Blakey
	(See 58f)				
58s§	Elements of Public Finance.....	IV	MWF	202B	Mr. Blakey
	(See 58f)				
59f	Life Insurance	II	TThS	102B	Mr. Graves
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
60w	Fire and Marine Insurance.....	II	TThS	102B	Mr. Graves
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
61s	Casualty Insurance	II	TThS	102B	Mr. Graves
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
62ff||	Elementary Accounting — Combined Course	II	MTWThFS	301B	Mr. Heilman
	(6 cred.; jr., sr.; no prereq.)				
68w	Sales Management	I	TThS	6B	Mr. Cassidy
	(3 cred.; jr., sr.; prereq., 1B or 77)				
69	Retail Store Management.....	Not offered			
	(3 cred.; jr., sr.; prereq., 1B or 77)				
70ff†	Statistics Survey Course.....	I	MTWThF	209B	Mr. Kozelka
	(5 cred.; jr., sr.; prereq., 4 or 6-7)				
71f	Traffic Management	I	MWF	6B	
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
71w	Traffic Management	VI	MWF	202B	
	(See 71f)				
71s	Traffic Management	VI	MWF	202B	
	(See 71f)				
72f	Transportation Services	VII	MWF	209B	
	(3 cred.; jr., sr.; prereq., 71)				
73w	Transportation Charges	VII	MWF	202B	
	(3 cred.; jr., sr.; prereq., 71)				
74s	Traffic Law	VII	MWF	209B	
	(3 cred.; jr., sr.; prereq., 71)				
77f||	Survey in Marketing.....	I	TThS	6B	Mr. Cassidy
	(3 cred.; jr., sr.; no prereq.)				
77s||	Survey in Marketing.....	I	TThS	202B	Mr. Cassidy
	(See 77f)				
78	Marketing of Raw Materials.....	Not offered			
	(3 cred.; jr., sr.; prereq., 1B or 77)				
79f	Marketing of Manufactured Goods...	II	TThS	202B	Mr. Cassidy
	(3 cred.; jr., sr.; prereq., 1B or 77)				
86f	Office Organization and Management..	IV	MWF	1B	Miss Donaldson
	(3 cred.; jr., sr.; prereq., 4 or 6-7)				
88s	Advertising	II	TThS	303B	Mr. Vaile
	(3 cred.; jr., sr.; prereq., 1B or 77 and Psy. 56)				
89f	Production Management	II	MWF	202B	Mr. Filipetti
	(3 cred.; jr., sr.; no prereq.)				
89w	Production Management	II	MWF	202B	Mr. Filipetti
	(See 89f)				

† Credit may not be received for both Economics 14 and B. A. 70.

‡ Credit may not be received for both Economics 3 and B. A. 57.

§ Credit may not be received for both Economics 191-192 and B. A. 58.

|| Not open to students who have received credit in either Econ. 20 or Econ. 25.

|| Not open to students who have received credit in 1B.

SCHOOL OF BUSINESS ADMINISTRATION

No.	Title	Hour	Day	Bldg.	Instructor
89s	Production Management (See 89f)	I	MWF	209B	Mr. Filipetti
92w,s	Accounting Practice Laboratory..... (1 cred.; jr., sr.; prereq., 132 or concurrent; open to accounting majors only)	III-IV	S	302B	Mr. Heilman
97f,98w,99s	Honors Course in Business Administration (Cred. ar.; jr., sr.; prereq., permission of the dean)	Ar	Ar	Ar	
100f	Report Writing (1 cred.; jr., sr.)	VI	T	202B	Mr. Heilman
100w	Report Writing (See 100f)	IV	T	202B	Mr. Heilman
100s	Report Writing (See 100f)	VI	T	202B	Mr. Heilman and others
101f-102w††	Advanced General Economics..... (6 cred.; sr.; prereq., 4 or 6-7)				
	Sec. 1	II	TThS	6B	Mr. Mudgett,
	2	III	MWF	102B	Mr. Schmidt,
	3	IV	MWF	102B	and others
101w-102s††	Advanced General Economics..... (See 101f-102w)	I	TThS	102B	Mr. Mudgett, Mr. Schmidt
107f†	Advanced General Economics—Combined Course (5 cred.; sr.; prereq., 4 or 6-7)	II	MTWThF	209B	Mr. Garver
109w	Business Policy (3 cred.; sr., grad.; prereq., 101-102)	VII	MWF	301B	Mr. Ostlund
109s	Business Policy (See 109f)	II	MWF	202B	Mr. Weidenhammer
112f	Business Statistics (3 cred.; jr., sr., grad.; prereq., 14)				
	Sec. 1	II	MWF	102B	Mr. Mudgett,
	2	III	TThS	102B	Mr. Kozelka
112w	Business Statistics (See 112f)				
	Sec. 1	I	MWF	303B	Mr. Mudgett,
	2	II	MWF	102B	Mr. Kozelka
112s	Business Statistics (See 112f)				
	Sec. 1	II	MWF	102B	Mr. Mudgett,
	2	IV	MWF	6B	Mr. Kozelka
130f	Cost Accounting (General Survey)... (3 cred.; jr., sr., grad.; prereq., 25-26)	I	TThS	303B	Mr. Ostlund
130s	Cost Accounting (General Survey)... (See 130f)	I	TThS	303B	Mr. Ostlund
132f	Cost Accounting (5 cred.; jr., sr., grad.; prereq., 25-26)	II	MTWThF	303B	Mr. Ostlund
132s	Cost Accounting (See 132f)	II	MTWThF	302B	Mr. Ostlund
133s	Cost Accounting Methods..... (3 cred.; jr., sr., grad.; prereq., 130 or 132)	I	MWF	6B	Mr. Ostlund

† The entire course must be completed before credit is received for any quarter.

†† Credit may not be received for both B. A. 101-102 and B. A. 107.

PROGRAM

No.	Title	Hour	Day	Bldg.	Instructor
134f	Income Tax Accounting (3 cred.; jr., sr., grad.; prereq., 138 or 139)	I	MWF	302B	Mr. Reighard
135f	Auditing and Public Accounting..... (3 cred.; jr., sr., grad.; prereq., 138 or 139)	III	MWF	301B	Mr. Reighard
136s	Internal Auditing (3 cred.; jr., sr., grad.; prereq., 138 or 139)	III	MWF	301B	Mr. Reighard
138w	Accounting Practice and Procedure... (See 138f)	III	MTWThF	302B	Mr. Heilman
139f	Advanced General Accounting..... (3 cred.; jr., sr., grad.; prereq., 25-26)	IV	MWF	303B	Mr. Heilman
139w	Advanced General Accounting..... (See 139f)	VI	MWF	302B	Mr. Heilman
139s	Advanced General Accounting..... (See 139f)				
	Sec. 1	III	MWF	302B	Mr. Heilman
	2	IV	MWF	302B	Mr. Heilman
142f	Money and Banking—Advanced Course (3 cred.; jr., sr., grad.; prereq., 3 and 4 or 6-7)				
	Sec. 1	II	MWF	6B	Mr. Marget,
	2	VI	MWF	202B	Mr. Myers
142w	Money and Banking—Advanced Course (See 142f)				
	Sec. 1	II	TThS	209B	Mr. Marget,
	2	IV	MWF	303B	Mr. Myers
142s	Money and Banking—Advanced Course (See 142f)	II	TThS	209B	Mr. Marget, Mr. Myers
145s	Foreign Exchange (3 cred.; jr., sr., grad.; prereq., 3 and 4 or 6-7)	IV	MWF		Mr. Myers
146f	Investments (3 cred.; jr., sr., grad.; prereq., 3 and 155)	VI	MWF	102B	Mr. Weidenhammer
147f	Bank Administration (3 cred.; jr., sr., grad.; prereq., 3 and 4 or 6-7)	I	MWF	301B	Mr. Myers
148w	The Securities Market (3 cred.; sr., grad.; prereq., 146, 149)	II	TThS	202B	Mr. Weidenhammer
155f	Corporation Finance (3 cred.; jr., sr., grad.; prereq., 3 and 4 or 6-7)	III	MWF	202B	Mr. Stehman
155w	Corporation Finance (See 155f)	III	MWF	202B	Mr. Stehman
155s	Corporation Finance (See 155f)	III	MWF	202B	Mr. Stehman
156f	Finance Management (3 cred.; jr., sr., grad.; prereq., 155)	I	TThS	102B	Mr. Stehman
165f	The Economics of Public Utilities.... (3 cred.; jr., sr., grad.; prereq., 3 and 4 or 6-7)	III	TThS	202B	Mr. Schmidt
165w	The Economics of Public Utilities.... (See 165f)	III	TThS	202B	Mr. Garver
165s	The Economics of Public Utilities.... (See 165f)	III	TThS	202B	Mr. Garver

SCHOOL OF BUSINESS ADMINISTRATION

No.	Title	Hour	Day	Bldg.	Instructor
167w	Personnel Administration (3 cred.; jr., sr., grad.; prereq., 161)	I	TThS	202B	Mr. Stead
168s	Advanced Personnel Administration (3 cred.; jr., sr., grad.; prereq., 167)	I	TThS	209B	Mr. Stead
177w	Foreign Trade (3 cred.; jr., sr., grad.; prereq., 176)	I	MWF	202B	Mr. Blakey
180f-181w- 182s†	The Senior Topics Courses (School of Business Adm. seniors)				
	A. Accounting (6 cred.; winter and spring only)	I	MWF	301B	Mr. Reighard
	B. Business Finance (6 cred.; winter and spring only)	VII	MWF	302B	Mr. Stehman and others
	C. Marketing (9 cred.)	VI-VII½	TTh	301B	Mr. Vaile and others
	D. Personnel Management (9 cred.)	VI-VII½	TTh	302B	Mr. Stead
	E. Secretarial Practice (6 cred.; winter and spring)	IV III	MWF MWF	1B(w) 1B(s)	Miss Donaldson
	F. Statistics (9 cred.)	Ar	Ar	Ar	Mr. Mudgett
	G. Production Management (9 cred.)	VI	MWF	209B	Mr. Filipetti
	H. Insurance (3 cred.; spring only)	Ar	Ar	Ar	Mr. Graves
	I. Traffic Management (3 cred.; spring only)	VIII	MWF	209B	
183f,w,s	Senior Practice Course (3 cred.; sr., grad.; no prereq.)	Ar	Ar	Ar	Members of the staff
194f-195w- 196s†	Advanced Advertising Procedure (3 cred.; jr., sr., grad.; prereq., 88)	IV	F	301Lib	Mr. Vaile

† The entire course must be completed before credit is received for any quarter.

COURSES IN OTHER COLLEGES REQUIRED IN CERTAIN SEQUENCES

THE COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS

AGRICULTURAL ECONOMICS

No.	Title	Hour	Day	Bldg.	Instructor
30f	Prices of Farm Products.....	II	TThS	302HH	Mr. Cox
40f	Principles of Market Organization....	I	MWF	312HH	Mr. Cox
40s	Principles of Market Organization....	II	TThS	312HH	Mr. Cox
90f	Agricultural Statistics				
	Lect.	III	TThS	312HH	Ar
	Lab.	Ar	Ar		
110f-111w	Economics of Agricultural Production	I	TThS	312HH	Mr. Johnson
131w	Market Prices	III	TThS	312HH	Mr. Waite
135s	Methods of Price Analysis.....	III	TThS	312HH	Mr. Waite
141w	Marketing Organization: Dairy and Poultry Products	II	TThS	312HH	Mr. Jesness
142s	Marketing Organization: Fruits and Vegetables	III	MW	312HH	Mr. Cox
150s	Advanced Farm Finance	VI-VII½	WF	312HH	Mr. Johnson
170s	Land Economics	VII-VIII½	TTh	302HH	Mr. Johnson
191w	Advanced Agricultural Statistics.....	IV	MWF	Ar	

THE COLLEGE OF ENGINEERING AND ARCHITECTURE

DRAWING AND DESCRIPTIVE GEOMETRY

No.	Title	Hour	Day	Bldg.	Instructor
64f	The Graphic Arts: Introduction.....	IV	MW	206E	Mr. Kirchner
65w	The Graphic Arts: Layouts.....	IV	MW	206E	Mr. Kirchner
66s	The Graphic Arts: Processes.....	IV	MW	206E	Mr. Kirchner

MATHEMATICS AND MECHANICS

85f	Strength of Materials with Laboratory				
	Lect.	II	MWF	Ar	Mr. Miller
	Lab.	VI-VII	M		

THE COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

COMPOSITION

No.	Title	Hour	Day	Bldg.	Instructor
18f-19w†	Types of Writing.....				
	Sec. 1	I	MWF	304F	Mr. Briggs
	2	III	MWF	305F	Mr. Mallam
	3	V	MWF	303F	Miss Armstrong
18s	Types of Writing.....				
	Sec. 1	I	MWF	304F	Mr. Briggs
	2	II	MWF	316F	Mr. Edmunds

† The entire course must be completed before credit is received for any quarter.

SCHOOL OF BUSINESS ADMINISTRATION

GEOGRAPHY

41f	Geography of Commercial Production	VI	MTWFS	133Ph	
41w	Geography of Commercial Production	IV	MTWFS	166Ph	
41s	Geography of Commercial Production	IV	MTWFS	166Ph	
102w	Trade Routes and Trade Centers.....	II	MWF	103Bu	

JOURNALISM

13f	Introduction to Reporting.....	I	MWF	10P	Mr. Kildow
	Reporting Conferences	Ar	Ar	Ar	
41w	Editing for Non-Majors.....				
	Lect.	I	MW	10P	Mr. Kildow
	Lab. Sec. 1	I-II	T	19P	
	2	VIII-IX	W	19P	
	3	VI-VII	Th	19P	
55f,w,s	Advertising and Newspaper Typog- raphy				
	Lect.	VII	M	14P	Mr. Barnhart
	Lab. Sec. 1	VIII-IX	MW	20P	
	2	VI-VII	TTh	20P	
	3	I-II	WF	20P	
69s	Newspaper and Magazine Articles....	I	MWF	10P	Mr. Kildow

MATHEMATICS

21	Elements of the Mathematics of Life				
	Insurance	Not offered			
30f	Analytic Geometry	I	MTWThFS	104F	Mr. Hart
30w	Analytic Geometry	I	MTWThFS	105F	Mr. Underhill
30s	Analytic Geometry	II	MTWThFS	105F	Ar
50f	Calculus I	III	MTWFS	105F	Mr. Jackson
50w	Calculus I	I	MWThFS	104F	Mr. Hart
51w	Calculus II	III	MTWFS	105F	Mr. Jackson
51s	Calculus II	I	MWThFS	104F	Mr. Hart

POLITICAL SCIENCE

No.	Title	Hour	Day	Bldg.	Instructor
181f-182w	International Law	IV	MWF	209Bu	Mr. Quigley

PSYCHOLOGY

56w	Psychology of Advertising.....	VII	MWF	133Ph	Mr. Longstaff
125f-126w†	Psychology of Individual Differences..	II	MWF	115Psy	Mr. Paterson
130s	Vocational Psychology	IX-X	F	301F	Mr. Paterson
160f	Psychology in Personnel Work.....	VI	MWF	115Psy	Mr. Longstaff

† Two quarters must be completed before credit is received for any quarter.

*The Bulletin
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Minnesota*

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and
The School for Dental Hygienists
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THE COLLEGE OF DENTISTRY
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THE SCHOOL FOR DENTAL HYGIENISTS

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- Harold G. Worman, D.D.S., Instructor in Oral Hygiene and Pathology

LECTURERS

- Frank E. Burch, M.D., F.A.C.S., Professor of Ophthalmology and Otolaryngology and Head of the Department of Ophthalmology and Otolaryngology
- George E. Fahr, B.S., M.D., Professor of Medicine
- Boyd S. Gardner, D.D.S., Associate Professor of Dental Surgery, Mayo Foundation
- Edwin L. Gardner, B.S., M.D., Associate Professor of Medicine
- Arthur S. Hamilton, B.S., M.D., Professor of Nervous and Mental Diseases, in charge of the Division of Nervous and Mental Diseases
- Thomas B. Hartzell, D.M.D., M.D., F.A.C.D., Research Professor of Mouth Infections
- Jennings C. Litzenberg, B.S., M.D., F.A.C.S., Professor of Obstetrics and Gynecology and Head of the Department of Obstetrics and Gynecology
- Robert I. Rizer, M.D., F.A.C.P., Assistant Professor of Medicine
- S. Marx White, B.S., M.D., F.A.C.P., Professor of Medicine

METALLOGRAPHY

- Ralph L. Dowdell, Met.E., Ph.D., Professor of Metallography

MILITARY SCIENCE AND TACTICS

- William C. Webb, Jr., D.D.S., Major, Dental Corps, U.S.A., Assistant Professor of Military Science and Tactics

FACULTY

5

PATHOLOGY

Elexious T. Bell, B.S., M.D., Professor of Pathology
Benjamin J. Clawson, M.D., Ph.D., Professor of Pathology
James S. McCartney, Jr., B.A., M.D., Assistant Professor of Pathology

PHARMACOLOGY

Arthur D. Hirschfelder, B.S., M.D., Professor of Pharmacology
Edgar D. Brown, Ph.D., M.D., Associate Professor of Pharmacology
Raymond N. Bieter, B.S., M.D., Instructor in Pharmacology

PHYSIOLOGY

Elias P. Lyon, Ph.D., M.D., LL.D., Professor of Physiology
Esther M. Greisheimer, Ph.D., M.D., Assistant Professor of Physiology
Jesse F. McClendon, Ph.D., Professor of Physiologic Chemistry
Frederick H. Scott, Ph.D., M.B., D.Sc., Professor of Physiology
Joseph King, M.A., M.D., Instructor in Physiology
Milo M. Loucks, Ph.D., Instructor in Physiology
Truman A. Pascoe, Ph.D., Instructor in Physiologic Chemistry

SURGERY

Owen H. Wangensteen, M.D., Ph.D., Associate Professor of Surgery and
Head of the Department of Surgery
Orwood J. Campbell, B.S., M.D., Instructor in Surgery
William T. Peyton, M.D., Ph.D., Instructor in Surgery

SPECIAL TEACHERS IN EXTENSION WORK

Adolph R. Ringoen, Ph.D., Assistant Professor of Zoology
Wilson D. Wallis, Ph.D., Professor of Anthropology
Berne G. De Vries, D.D.S., F.A.C.D., Lecturer in Orthodontia
Esther N. Farrand, B.S., D.D.S., Lecturer in Orthodontia

HEADS OF UNIVERSITY DEPARTMENTS GIVING COURSES FOR DENTAL HYGIENISTS

F. Stuart Chapin, Ph.D., Professor of Sociology, Chairman of the Department of Sociology, and Director of the Training Course for Social and Civic Work
Harold S. Diehl, M.A., M.D., Professor of Preventive Medicine and Public Health, Director of the Students' Health Service and of the Department of Preventive Medicine and Public Health
Richard M. Elliott, Ph.D., Professor of Psychology and Chairman of the Department of Psychology
J. Anna Norris, M.D., Professor of Physical Education for Women and Director of Health and Physical Education for Women
Frank M. Rarig, M.A., Professor of Public Speaking and Chairman of the Department of Public Speaking

Dwight E. Minnich, Ph.D., Professor of Zoology and Head of the Department of Zoology

Russell A. Stevenson, Ph.D., Dean of the School of Business Administration

C. A. Moore, Ph.D., Professor of English and Chairman of the Department of English

Rodney M. West, B.A., Registrar, University of Minnesota, Secretary of the Faculty, College of Dentistry, University of Minnesota

GENERAL INFORMATION

COURSES OFFERED IN THE COLLEGE OF DENTISTRY

FIVE-YEAR COURSE

The College of Dentistry unites with the College of Science, Literature, and the Arts in offering a five-year course consisting of two years in Arts and three years in Dentistry, leading to the degree of doctor of dental surgery.

COMBINED COURSE IN MEDICINE AND DENTISTRY

Students contemplating such a course are advised to complete the admission requirements for the Medical School and the first two years of medical science in that school. Further information may be obtained from the Administrative Board of the Medical School and the dental faculty.

REQUIREMENTS FOR ADMISSION

Application for admission should be in the examiner's office not later than July 1. All accepted applicants will receive a bill for a ten-dollar preliminary fee, payable within ten days. This fee is not returnable.

Applicants for admission must present two years of collegiate work (ninety quarter, or sixty semester, credits) in science, literature, and the arts, completed at this or some other recognized college or university.

The minimum requirements for admission include nine quarter (six semester) credits in English (rhetoric); twelve quarter (eight semester) credits in zoology; twenty quarter (thirteen and one-third semester) credits in chemistry (including general inorganic, qualitative analysis, organic); four quarter (two and two-thirds semester) credits in mathematics; eight quarter (five and one-third semester) credits in physics; six quarter (four semester) credits each in mechanical engineering (shop practice) and drawing; six quarter (four semester) credits in psychology; and enough additional credits to make a total of at least ninety quarter (sixty semester) credits. The faculty may accept electives for mechanical engineering, drawing, and psychology.

At Minnesota the pre-dental requirements are met by the following two-year course of study, provided high school chemistry and higher algebra are presented for admission (if these are not presented, Chemistry 1-2-3 is required instead of Chemistry 4-5; and Mathematics 3 must be taken as a prerequisite to Mathematics 4 or 6):

1. Zoology 5-6-7, twelve quarter credits
2. Chemistry 4-5, 11, Organic 1-2, twenty quarter credits
3. Mathematics 4, four quarter credits; or Mathematics 6, five quarter credits
4. Physics 3-4, and one of 23-24, 33-34, 43-44, eight quarter credits
5. Freshman English A-B-C, fifteen quarter credits; or Composition for Technical Students 4-5-6, nine quarter credits

6. *Drawing 41-42-43, six quarter credits
7. *Mechanical Engineering 11-12-13, six quarter credits
8. *Psychology 1-2, six quarter credits
9. Electives to make a total of ninety quarter credits

Those whose pre-dental work has been taken elsewhere than at the University of Minnesota must present to the examiner certified credentials of both preparatory and college work showing the subjects completed, credits, and grades.

Students preparing for admission to the College of Dentistry are advised to follow this arrangement as closely as possible.

ADMISSION TO ADVANCED STANDING

Students from other dental colleges whose standards are fully equivalent to those of this institution, may be received into advanced classes. Such students must make formal application on the blank provided, and must submit credentials covering pre-dental and dental studies. Such credentials must show that the student had the required pre-dental subjects and has maintained the standard of scholarship required of students of this college.

As a rule notebooks and other evidences of laboratory work must be presented. The amount of credit to be granted a student from another school is decided by the heads of the respective departments in conference with the Students' Work Committee. Subject credit, but not legal time credit, may be given for studies pursued other than in dental schools.

Students desiring advanced standing at the University of Minnesota should have a transcript of their record sent to the university examiner by the registrar of the college previously attended.

Students from foreign dental schools (not including Canadian schools) who are not graduates, will not be given credit in any course, except after examination.

REQUIREMENTS FOR GRADUATION

A candidate for the degree of doctor of dental surgery must be twenty-one years of age, of good moral character, and, after satisfying all the requirements for admission to the college, must have complied with all the rules and regulations of the college and obtained regular credit for all subjects of the entire course.

RECOGNITION

The Board of Dental Examiners in all states requiring a five-year course of study, in addition to fifteen units of secondary school education, for the degree of doctor of dental surgery, recognizes our graduates and admits them to examination.

On the recommendation of the Board of Examiners in Dental Surgery, the Council of the Royal College of Surgery, in London, has added the College of Dentistry of the University of Minnesota to the list of dental schools recognized by the college. This recognition implies that the Royal

* The faculty may accept electives for these courses.

College of Surgeons will exempt graduates in dental surgery of the University of Minnesota from the preliminary science examination for the license in dental surgery, and they will be admitted to the first and second professional examinations on producing the required certificates of study.

SUMMER SESSION

A summer session of six or eleven weeks is offered in the Departments of Anatomy, Bacteriology and Immunology, Chemistry, Dentistry, Pathology, Pharmacology, and Physiology. For detailed statements, see summer session bulletin.

FEEES

Tuition fee (per quarter):	
Residents of Minnesota.....	\$60.00
Non-residents	70.00
Clock hour tuition fee (unclassified students, auditors and others carrying less than full work):	
Residents of Minnesota	2.50
Non-residents	3.00
Deposit (first quarter only).....	10.00
Military deposit (required of all students taking military drill).....	10.00
Incidental fee	6.00
Graduation fee	10.00
Special fees:	
Examination for removal of condition.....	1.00
Examinations for credit (after the first quarter in residence).....	5.00
Special examination	5.00
Laboratory deposit (required of students registered for courses in chemistry)	5.00

REGISTRATION PENALTIES

A penalty fee for late registration, late change of registration, or late payment of fees shall be two dollars (\$2) and one dollar (\$1) additional for each day of delay after classes begin, provided that no student shall pay more than ten dollars (\$10) of penalty in any given quarter.

LIBRARY

The complete library of dental books, literature and periodicals is maintained in the general university library, in a special section devoted to medical, dental and biological sciences.

HONOR FRATERNITY

The Beta Beta chapter of the Omicron Kappa Upsilon has been organized. Students are chosen for membership in the senior year by the faculty on the basis of scholarship, character and conduct during their entire course and not more than twelve per cent of each class is eligible.

SCHOLARSHIPS AND LOAN FUNDS

A scholarship of fifty dollars annually is available to assist a worthy student in dentistry.

The University Loan Funds are available to students after one quarter in residence to assist them in continuing their course. Scholarship and character are the basis on which these loans are made available to students.

INTERNESHIIPS

Two interneshiips at the College of Dentistry are offered annually to graduates desiring to devote further time to study and clinical work before engaging in the teaching or practice of dentistry. An increasing number of hospitals are offering interneshiips to dental graduates.

GRADUATE WORK

Graduate work and opportunities for research are open in certain fields of dentistry to properly qualified students.

The qualifications for admission to graduate work in this field are a baccalaureate degree from an acceptable college or university, and the dental degree from this or any other approved college of dentistry. Such qualified students desiring graduate work will pursue courses of study in accordance with the regulations of the Graduate School. They may elect majors and minors for the graduate degree from the graduate courses in anatomy, embryology, histology, neurology, pathology, bacteriology, chemistry, physiology, and physiologic chemistry. The material for investigation along dental lines in these various subjects is available from the dental clinic, the medical dispensary, the University Hospital, and the Mayo Clinic, at Rochester, Minnesota, through the Mayo Foundation for Medical Education and Research. The Mayo Foundation offers several fellowships in dentistry similar to fellowships in other specialties on the foundation.

No special bulletin is issued for this work. The interested student will find the general conditions and the courses in the above fields set forth in the bulletin on graduate work in medicine.

PRACTITIONERS' COURSES

In order to enlarge its educational field and to fill a want that has found expression among practitioners, the College of Dentistry through the General Extension Division offers from time to time a series of courses in crown and bridge work, oral diagnosis, operative dentistry, orthodontia, prosthetic dentistry, periodontia, oral hygiene, oral surgery, and similar subjects. These courses are confined to graduate dentists.

There is also an opportunity for a dentist to come into the College of Dentistry for clinical courses at any time of the year by registering through the General Extension Division. The courses which may be taken in from one to two weeks at any time during the school sessions are: crown and bridge work, oral diagnosis, operative dentistry, prosthetic dentistry, periodontia, and oral surgery.

Registration and payment of fees may be arranged for in advance by correspondence, or by personal interview through the General Extension Division.

COURSES OF STUDY IN THE COLLEGE OF DENTISTRY FOR 1930-32

	Fall Quarter		Winter Quarter		Spring Quarter		Total	
	Crs.	Hrs.	Crs.	Hrs.	Crs.	Hrs.	Crs.	Hrs.
PRE-JUNIOR YEAR								
Anatomy, Gross	5	99	..	..	5	99	10	198
Anatomy, Hist. & Embry..	..	..	6	132	..	..	6	132
Anatomy, Oral	3	77	2	44	2	44	7	165
Bacteriology, Gen. & Spec. ..	..	..	4½	66	..	..	4½	66
Chemistry, Physiologic ...	4	44	..	..	..	..	4	44
Physiology .....	..	..	..	..	6	99	6	99
Prosthesis	4	110	5	143	5	143	14	396
	16	330	17½	385	18	385	51½	1100
JUNIOR YEAR								
Crown and Bridge Work..	2	66	3	99	3	99	8	264
Diagnosis, Gen. & Oral..	..	..	1	11	..	..	1	11
Metallography .....	..	..	..	..	2	33	2	33
Operative Dentistry	5	143	4	110	5	143	14	396
Oral Histology & Pathology ..	..	..	2	22	2	22	4	44
Oral Hygiene .....	..	..	..	..	1	11	1	11
Oral Surgery	1	11	1	22	..	..	2	33
Orthodontia .....	..	..	..	..	1	33	1	33
Pathology, Gen. & Spec... 6	110	..	..	..	..	..	6	110
Pharmacology .....	..	..	5	66	..	..	5	66
Prosthesis	1	11	2	44	3	77	6	132
	15	341	18	374	17	418	50	1133
SENIOR YEAR								
Crown and Bridge Work..	3	77	3	77	3	77	9	231
Diagnosis, Gen. & Oral..	2	44	..	..	..	..	2	44
Operative Dentistry	4	110	5	143	5	143	14	396
Orthodontia	2	44	2	44	2	44	6	132
Periodontia	1	33	1	33	..	..	2	66
Prosthesis	2	66	2	66	2	66	6	198
Surgery	2	44	1	33	1	33	4	110
Surgery, Principles of....	..	..	..	..	2	22	2	22
Thesis & Seminar.....	..	..	1	11	1	11	2	22
	16	418	15	407	16	396	47	1221

DESCRIPTION OF COURSES

EXPLANATIONS

A *dagger* (†) indicates that all quarters of the course must be completed before credit is received for any quarter.

ANATOMY

- 9f,su. Systematic Anatomy. Lectures and recitations on the gross morphology of the various systems of the body. Laboratory work upon human and mammalian material. Special emphasis laid upon human osteology. 9 hours a week. 5 credits. Offered to pre-juniors. Prerequisite: Zoology 5-6-7. Enrolment limited to 90 students in the fall quarter. Prof. Jackson, Asst. Prof. Miller, and assistants.
- 10s,su. Anatomy of the Head and Neck. Dissection of the human head and neck, with lectures and recitations. 9 hours a week. 5 credits. Offered to pre-juniors. Prerequisites: Zoology 5-6-7, Anatomy 9. Enrolment limited to 90 students in the spring quarter, and 30 in the summer. Asst. Prof. Miller and assistants.
- 14w,su. Histology and Embryology. Minute structure and development of the tissues and organs of the body, with special emphasis upon the teeth and digestive tract. Lectures, recitations, and laboratory work. 12 hours a week. 6 credits. Offered to pre-juniors. Prerequisites: Zoology 5-6-7, Anatomy 9. Enrolment limited to 90 students in the winter quarter. Prof. Rasmussen and assistants.

BACTERIOLOGY AND IMMUNOLOGY

- 52w. Dental Bacteriology. Morphology; methods of staining; culture media; methods of identification; principles of sterilization and disinfection; concept of infection; pathogenic bacteria; the oral flora; bacteriology of the stomatitides, dental caries, alveolar abscess, and pyorrhea; systemic infections secondary to bacterial diseases of the mouth and teeth. 66 hrs. 4½ credits. Offered to pre-juniors. Prof. R. G. Green and assistants.

DENTISTRY

NOTE.—Courses numbered from 50 through 59 are pre-junior courses; those from 60 through 79 are junior courses; those from 80 through 101 are senior courses.

DIVISION OF CROWN AND BRIDGE WORK

- 70f-71w-72s. Crown and Bridge Work. A technic course. Lectures, demonstrations, and laboratory work including all the more important forms of crowns and bridges. 264 hours. 8 credits. Prerequisite: Oral Anatomy 50-51-52. Profs. Wells, Reynolds, Asst. Profs. A. B. Hall, E. A. Nelson, Dr. Peterka.

90f-91w-92s.† Crown and Bridge Work. A course of 33 lectures and 198 clinical hours, covering the entire field of crown and bridge work. 9 credits. Prerequisite: Crown and Bridge Work 70-71-72. Profs. Wells, Brekhus, Pagenkopf, Tinker, Vehe, Assoc. Profs. H. C. Nelson, Otto, Asst. Prof. McCarthy.

DIVISION OF ORAL ANATOMY

50f-51w-52s. Oral Anatomy. Lectures and recitations on anatomy and nomenclature of teeth, and such laboratory work as drawing, dissecting, modeling, and carving of the teeth. Special attention given the physiological function of tooth form and its practical application. 33 lecture and recitation hours, 132 laboratory hours. 7 credits. Profs. Damon, Rudolph, Assoc. Profs. Cooperman, Lawton, Asst. Prof. Harker.

DIVISION OF ORAL DIAGNOSIS

73w. Oral Diagnosis. A consideration of the methods in oral diagnosis with special emphasis on the application of the X-ray. 11 hours lecture. 1 credit. Profs. Brekhus, Knight, Waldron, Assoc. Prof. Wahlquist.

93f. Oral Diagnosis. (1) A study of patients entering the clinic to determine the conditions of the teeth and surrounding tissues and advise medical measures. (2) A study of selected cases from a medical point of view, aiming to correlate the condition of the teeth with the patient's state of health. 11 lecture hours, 33 clinical hours. 2 credits. Prerequisite: Oral Diagnosis 73. Prof. Brekhus, Knight, Waldron, Assoc. Prof. Wahlquist.

DIVISION OF OPERATIVE DENTISTRY

60f. Operative Dentistry. A course of lectures, recitations, demonstrations, and laboratory work. 143 hours. 5 credits. Prerequisite: Oral Anatomy 50-51-52. Prof. R. O. Green, Asst. Profs. Butter, Thom.

61w-62s.† Operative Dentistry. A course of 22 lecture and recitation hours and 231 clinical hours. 9 credits. Prerequisites: Operative Dentistry 60, Histology and Embryology 14. Prof. Shellman, Assoc. Profs. Cox, Maybury, Asst. Profs. Butter, Estes, Parker, Thom, Dr. Thiers.

80f-81w-82s.† Operative Dentistry. A course of 33 lecture and recitation hours and 363 clinical hours. 14 credits. Prerequisite: Operative Dentistry 60-61-62. Profs. Walls, Godfrey, R. O. Green, Vehe, Assoc. Profs. Little, Patridge, Asst. Profs. Butter, Freeburg, Henry, Dr. Lundberg, Dr. Wittich.

DIVISION OF ORTHODONTIA

69s. Orthodontia. A course of lectures, recitations, and laboratory work in the making of regulating appliances. 33 hours. 1 credit. Assoc. Prof. Lawton, Asst. Prof. Wendell.

87f-88w-89s.† Orthodontia. A course of lectures, recitations, and clinical work. Every student is required to treat at least one case of irregular-

ity of the teeth. 33 lecture and recitation hours and 99 clinical hours. 6 credits. Prerequisites: Orthodontia 69, Operative Dentistry 60-61-62. Profs. O. A. Weiss, Flagstad, Lasby, Rudolph, Dr. Baker.

DIVISION OF ORAL HYGIENE AND PATHOLOGY

- 77s. Oral Hygiene. Lectures and recitations on general and oral hygiene. 11 hours. 1 credit. Prerequisite: bacteriology. Assoc. Prof. Wahlquist.
- 78w-79s.† Oral Histology and Pathology. Lectures and recitations on the special histology and pathology of the teeth and other oral tissues. 44 hours. 4 credits. Prerequisites: bacteriology and pathology. Prof. Waldron, Dr. Clark, Dr. Worman.
- 98f-99w.† Periodontia. An intensive demonstration and practice course in the causes, treatment, and prevention of gingivitis and dental periclasia and in the prevention of dental caries. Special attention is paid to diagnosis and to systemic complications. 66 hours. 2 credits. Prerequisite: Operative Dentistry 60. Prof. Waldron, Asst. Prof. R. E. Johnson, Dr. Clark, Dr. Radosch.

DIVISION OF ORAL SURGERY

- 74f-75w.† Oral Surgery. Principles underlying general surgical procedure; development and application of anesthesia chiefly as applied to face, mouth, and jaws. General considerations in the extraction of teeth, and the removal of foci of infection. 22 lecture and recitation hours and 11 clinical hours. 2 credits. Profs. Griffith, Maves, Waldron, Wiethoff, Assoc. Prof. MacGibbon, Asst. Profs. Hermann, E. W. Nelson, Dr. Hayes.
- 95f.† Oral Surgery. Diagnosis and treatment of surgical diseases of the face, mouth, and jaws. Practice in local and general anesthesia. Consideration of types of patients and complications. 22 lecture and recitation hours and 55 clinical hours. 3 credits. Profs. Griffith, Maves, Waldron, and assistants.
- 96w-97s. Oral Surgery. A course of lectures, recitations, and demonstrations covering the diagnosis, treatment, and dental relationship of diseases and conditions of the mouth, jaws, throat, eyes, ears, nose, and face. 33 lecture and recitation hours. 1 credit. Prerequisite: Oral Surgery 74-75. Prof. Waldron.

DIVISION OF PROSTHETIC DENTISTRY

- 53f-54w-55s. Prosthetic Dentistry. A course of lectures, recitations, and laboratory work covering the use of impression materials and the different processes of plate work. 33 lecture and recitation hours. 363 laboratory hours. 14 credits. Profs. Damon, Rudolph, Assoc. Prof. Cooperman, Asst. Profs. Harker, Wendell, Dr. Heckler.
- 63f-64w-65s.† Prosthetic Dentistry. A course of lectures and recitations covering the subject of prosthetic dentistry in preparation for clinical work. 33 hours. 3 credits. Prerequisite: Prosthetic Dentistry 53-54-55. Prof. O. A. Weiss.

- 67w-68s.† Prosthetic Dentistry. Clinical practice in denture work. 99 hours. 3 credits. Prerequisite: Prosthetic Dentistry 53-54-55. Profs. Lasby, Flagstad, Asst. Profs. Delton, Jernall.
- 83f-84w-85s.† Prosthetic Dentistry. A course of clinical work in prosthesis, cleft palate, and final restorations. 198 hours. 6 credits. Prerequisites: Prosthetic Dentistry 63-64-65 and 67-68. Profs. Lasby, Flagstad, O. A. Weiss, Asst. Profs. Delton, Jernall.

THESIS AND SEMINAR

- 100w-101s.† A thesis, seminar, and lecture course in the theory and practice of medicine and dentistry, applied economics, jurisprudence, psychology, ethics, etc. 22 hours. 2 credits. Profs. Lasby, F. E. Burch, George E. Fahr, A. S. Hamilton, T. B. Hartzell, J. C. Litzenberg, S. Marx White, Assoc. Profs. Boyd S. Gardner, E. L. Gardner, Asst. Prof. R. I. Rizer.

METALLOGRAPHY

- 159s. Dental Metallography. Lectures, recitations, and demonstrations, taking up the most important metals with special reference to those used in dentistry and the study of dental alloys from the standpoint of metallography. 33 hours. 2 credits. Offered to juniors. Prof. Dowdell.

MILITARY SCIENCE AND TACTICS

BASIC COURSE

A Basic Course in Military Science and Tactics is offered in the first year of the dental course. The course consists of subjects of a medical nature that were not taught during the two years military instruction prior to the enrolment of the student in the College of Dentistry. The course is designed to prepare the student to derive the maximum benefit from the practical work given in the advanced R.O.T.C. camp.

ADVANCED COURSE

The Advanced Course is offered in the junior and senior years to such students as have satisfactorily completed the Basic Course and have been selected by the professor of military science and tactics and the dean of the Dental College. A satisfactory completion of the Advanced Course is a requisite for graduation for all students who elect this course unless relieved by proper authority. All Advanced Course students are required to attend one summer camp. While in camp the student is subsisted, housed, and clothed at the expense of the government, and transportation is paid to and from camp. Students receive the pay of an enlisted man of the seventh grade for the period of the camp and commutation of rations throughout the two academic years of their Advanced Course and one vacation intervening. All students who satisfactorily complete the Advanced Course will be recommended for a commission as first lieutenant, Dental Section, Reserve Officers Corps.

SUBJECTS

In general terms, the course of instruction comprises subjects which are fundamental to the Medical Department of the Army in its functions as a branch and those subjects which are military specialties of the Dental Corps.

PATHOLOGY

- 4f. General and Special Pathology. Circulatory disturbances, metabolic changes in cells and tissues, pigment deposits, inflammations and tumors. Pathology of selected diseases, tumors, and lesions with reference to those affecting mouth and dental structures. Exercises in gross and microscopic diagnosis. 110 hours. 6 credits. Offered to juniors. Prerequisites: Gross Anatomy 9-10, Histology and Embryology 14. Prof. Clawson and assistants.

PHARMACOLOGY

- 4w. Pharmacology. The history, origin, nature, pharmacal preparations, and use of drugs, including the discussion of their physiologic, pharmacologic, and therapeutic actions. 44 hours. 4 credits. Offered to juniors. Assoc. Prof. Brown.
- 6w. Experimental Pharmacology. Laboratory exercises upon the chemical composition and mode of action of typical drugs upon man and animals, primarily for students in dentistry. One exercise a week. 22 hours. 1 credit. Offered to juniors. Prof. Hirschfelder, Assoc. Prof. Brown, Dr. Bieter.

PHYSIOLOGY

- 57f,su. Physiologic Chemistry. An intermediate course. 44 hours. 4 credits. Offered to pre-juniors. Prerequisites: Zoology 1-2 or 5-6-7; organic chemistry. Prof. McClendon.
- 60s. Physiology. An intermediate course. 99 hours. 6 credits. Offered to pre-juniors. Prerequisites: Zoology 1-2 or 5-6-7; Chemistry 1-2-3 or 4-5. Profs. Lyon, Scott, Asst. Prof. Greisheimer, Dr. Loucks or Dr. King and assistants.

SURGERY

- 52s. Principles of Surgery. A study of the various surgical inflammations and processes; pathology and treatment. Principles underlying general surgical procedure as applied in dental practice. 22 hours. 2 credits. Offered to seniors. Dr. Campbell, Dr. Peyton.

THE SCHOOL FOR DENTAL HYGIENISTS

GENERAL INFORMATION

PURPOSE

The School for Dental Hygienists has been established primarily to fill the need for workers in the public schools, hospitals, mercantile and industrial institutions, and dental offices to do dental prophylaxis work and to teach the hygiene of the mouth—in other words to do preventive dental work which has not been possible in the organization of dentistry up to the present and which is recognized to be one of the great physical needs of the times. As thoro a background of scientific and cultural subjects as is possible in the time of the course is included to give students that professional education and point of view without which they would be mere technicians and quite unsafe to turn loose on the public in the semi-independent capacity which the nature of their work demands. The course includes training in all branches of dental office assisting and should make graduates easily adaptable to the general and special needs of the private dental offices should that be the field of work selected.

The course requires two years of thirty-three weeks each and leads to the degree of graduate dental hygienist (G.D.H.). The incorporation of this work in the University makes it possible to give all the subjects of the curriculum in the appropriate departments of the University, thus assuring a university contact to the student and instruction under the best auspices.

The first year's work deals mostly with preliminary science courses and dental technique and corresponds to some extent with the year course given at other schools. The second year is designed to prepare the student particularly for work in the public schools and clinics where the worker must be largely on her own responsibility and must be able to take an active part in oral hygiene work with the public.

REGISTRATION

Applicants for admission may obtain credential blanks from the office of the registrar, University of Minnesota. These should be filled out and sent by the principal or superintendent of the high school or preparatory school to the registrar's office.

All applications should be filed before August 15.

Notification of acceptance or rejection will not be sent before August 15 but applicants will be informed whether their credentials are satisfactory as they come in. On receipt of notice of acceptance a preliminary fee of ten dollars (\$10) must be sent as a guaranty of the candidate's intention to enter and in order that a place may be held. This will be applied on the first quarter's tuition fee and is not refundable.

For further information in regard to registration and to the general requirements for admission to the University, application may be made for the bulletin of general information.

REQUIREMENTS FOR ADMISSION

The School for Dental Hygienists requires, for admission, graduation from an approved high school or other preparatory school on the accredited list and applicant must present the minimum requirements of a major and two minors. (See the general information bulletin for a complete statement of admission requirements.)

Preference will be given to women of superior preliminary training. Applicants must be not less than eighteen nor more than thirty-five years of age. They must be able to pass a satisfactory general physical examination by the school physician. The beginning class is limited to twenty-five students.

FEES

Preliminary fee (to be applied on tuition fee of first quarter).....	\$10.00
Tuition fee (per quarter)	25.00
Deposit (first quarter only).....	10.00
Incidental fee	6.00
Special fees:	
Examination for removal of condition.....	1.00
Examination for credit (after first six weeks in residence)....	5.00
Special examination	5.00
Graduation fee	10.00

Registration penalties.—A penalty fee for late registration, late change of registration, or late payment of fees shall be two dollars (\$2) and one dollar (\$1) additional for each day of delay after classes begin, provided that no student shall pay more than ten dollars (\$10) of penalty in any given quarter.

Part time fees.—Students not registered for the full course will be charged tuition at the rate of \$2 per credit.

ADVANCED STANDING

Graduates of approved training schools for nurses who are also graduates of accredited high schools will be admitted for advanced standing in the School for Dental Hygienists, and should be able to complete the remainder of the work required for the degree of graduate dental hygienist in one college year. Graduate nurses will be given permission to enter the school for one quarter's work to qualify them according to the law to take the state board examination for a license to practice dental hygiene. Such students will not be candidates for the degree of graduate dental hygienist and will be given university credit only in so far as it would apply if sufficient work to qualify for the degree were taken later.

INSTRUMENTS

The University will furnish the larger pieces of equipment needed for the work in the clinic and laboratories but the students must furnish their own uniforms, caps, operating instruments, and supplies. These instruments and supplies will be needed at the beginning of the freshman year. They will cost approximately sixty dollars. Some few textbooks will be required, also a manikin fee of \$7.

PRIZES

Alpha Kappa Gamma prize in dental hygiene.—The active chapter of Alpha Kappa Gamma Sorority offers an annual prize of ten dollars (\$10) in gold to that student graduating from the School for Dental Hygienists who has maintained the highest scholastic average and who has completed her entire course at the University of Minnesota.

The Louise C. Ball prize.—Annually Louise C. Ball, B.A., D.D.S., who founded the courses in oral hygiene in New York City, July 10, 1916, at Columbia University, will give a prize of forty dollars in gold to the student in the graduating class writing the best essay on "Preventive Dentistry in the Home."

COURSES OF STUDY IN THE SCHOOL FOR DENTAL HYGIENISTS

	Fall Quarter		Winter Quarter		Spring Quarter		Total	
	Crs.	Hrs.	Crs.	Hrs.	Crs.	Hrs.	Crs.	Hrs.
FIRST YEAR								
Anatomy, Oral	2	44	2	44	1	33	5	121
Anatomy, Elementary ....	..	..	3	33	..	..	3	33
Bacteriology, Elem.	4	66	..	..	..	..	4	66
Composition, Freshman ..	3	33	3	33	3	33	9	99
Hygiene, Preliminary	0	11	..	..	..	..	0	11
Physical Training, Elem..	0	33	0	33	0	33	0	99
Physiology and Physiologic Chemistry, Elem. ....	..	..	..	..	7	99	7	99
Prophylaxis, Dental	2	66	..	..	1	33	3	99
Prosthetic Dent. ....	..	..	..	..	2	44	2	44
Public Speaking .....	..	..	3	33	3	33	6	66
Zoology, General	4	77	4	77	..	..	8	154
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	15	330	15	253	17	308	47	891
SECOND YEAR								
Dental Laboratory	1	33	..	..	..	..	1	33
Educational School Work.	2	44	2	44	2	44	6	132
Hygiene, Oral .....	..	..	..	..	1	11	1	11
Health Care of the Family	..	..	..	..	3	55	3	55
Office Practice .....	..	..	2	22	..	..	2	22
Pathology, General	1	11	..	..	..	..	1	11
Pathology, Oral .....	..	..	2	22	..	..	2	22
Principles of, and Clinical Dentistry	2	66	..	..	..	..	2	66
Prophylaxis, Dental	2	66	2	66	2	66	6	198
Prosthetic Dentistry	2	44	..	..	..	..	2	44
Psychology, General	3	33	3	33	..	..	6	66
Sociology, Introduction to	..	..	..	..	5	55	5	55
Thesis and Seminar .....	..	..	..	..	1	11	1	11
Electives	2	22	4	44	1	11	7	77
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	15	319	15	231	15	253	45	803

DESCRIPTION OF COURSES

FIRST YEAR

ANATOMY

4f,w,s. Elementary Anatomy. A brief survey of human gross anatomy including a brief introduction to histology, followed by a more detailed study of the anatomy of the oral region. Recitations and demonstrations. Three hours a week for one quarter. Dr. Fisher.

BACTERIOLOGY AND IMMUNOLOGY

1f,w,s,su. Elementary Bacteriology. The principles and technic of general bacteriology. Studies of the morphologic and biologic characters of the common bacteria. Preparation of culture media. Disinfectants and disinfection. Bacteriology of water and food products. Six hours a week for one quarter. Dr. Skinner.

DENTISTRY

ORAL ANATOMY

7f,8w,9s.† Oral Anatomy. A course of lectures and recitations on the anatomy and nomenclature of the teeth and such laboratory work as drawing, dissection, modeling, and carving of the teeth. Special attention is given to the physiological function of tooth form and its practical application. Four hours a week for three quarters. Asst. Prof. Harker.

PROSTHETICS

6s. Prosthetic Dentistry. Course of lectures, recitations, and laboratory work covering impression materials and their manipulation; making of study models; and important laboratory phases of denture construction. Four hours a week for one quarter—one lecture hour and three laboratory hours per week. Asst. Prof. Harker.

ORAL HYGIENE AND PATHOLOGY

21f,w-22s. Dental Prophylaxis. Theory and practice in the technic and application of dental prophylaxis and oral hygiene. The work is introduced by practice on manikins, followed by practice on actual patients in the dental infirmary. Six hours a week in the fall or winter quarters and three hours a week in the spring quarter. Miss Jackson.

ENGLISH

4f-5w-6s. Freshman Composition. The study of the fundamental principles of composition and training in the art of writing. Three hours a week for three quarters. Arranged by Prof. Moore.

PHYSICAL EDUCATION FOR WOMEN

- 1f-2w-3s. Elementary Physical Training. Lighter forms of gymnastics, apparatus work, orthopedic exercise, folk dancing, indoor and outdoor games. Individual health consultations. Arranged by Prof. Norris and staff.
- 4f. Preliminary Hygiene. One lecture a week. The most essential aspects of the care of personal health. Prof. Norris.

PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

- 1f,s. Elementary Physiology and Physiologic Chemistry. The functional properties of tissue cells; the material basis of the body; the nutritive media; the physiology of nerve and muscle, of the nervous system, the vascular mechanism, respiration, digestion, excretion, and metabolism. This course is preceded by a chemistry course which serves as a foundation for physiology. Nine hours a week for one quarter. Asst. Prof. Greisheimer.

SPEECH

- 41w-42s. Public Speaking. Fundamentals of effective speaking; breathing, voice production, enunciation, and action; delivery of extracts from the works of well-known writers and speakers; principles underlying speech making applied in both oral and written compositions. Three hours a week for two quarters. Arranged by Prof. Rarig and staff.

ZOOLOGY

- 5f-6w,† General Zoology. This course is designed to acquaint the student with the fundamental principles of general zoology. It deals especially with the structure, physiology, embryology, classification, and evolution of animals. Textbook, lectures, quizzes, and laboratory. Seven hours a week for two quarters. Arranged by Prof. Minnich.

SECOND YEAR

BUSINESS

- 95Nw. Office Practice. A study of the most approved practices relative to the conduct of an office; appliances, accounts, records, correspondence, filing systems. Two hours a week for one quarter. Arranged by Prof. Stevenson.

DENTISTRY

CROWN AND BRIDGE

- 29f. Dental Laboratory. A technic course in the manipulation of investments, waxes, metals, and porcelain including simple bridge construction as used in the dental office laboratory. Three hours a week for one quarter. Dr. Peterka.

ORAL HYGIENE AND PATHOLOGY

- 39f. General Pathology. A lecture course on the general pathological conditions. One hour a week for one quarter. Assoc. Prof. Wahlquist.
- 40w. Oral Pathology. A course on special pathology of teeth and oral tissues, including systemic manifestations of oral diseases. Two hours a week for one quarter. Dr. Radusch.
- 23f-24w-25s. Dental Prophylaxis. A continuation of Prophylaxis 21-22. The teaching of oral hygiene is emphasized. Six hours a week for three quarters. Miss Jackson.
- 10f-11w-12s. Educational School Work. A recitation course in the preparation and delivery of talks on oral hygiene for various groups and occasions followed by demonstrations and practical work in teaching oral hygiene in the public schools. Four hours a week for two quarters. Dr. White.
- 31s. Oral Hygiene. Lectures and recitations dealing with the causes and prevention of dental diseases especially as related to general physiology and hygiene. One hour a week for one quarter. Assoc. Prof. Wahlquist.

PROSTHETICS

- 7f. Prosthetic Dentistry. Continuation of 6s. Four hours a week for one quarter. One lecture and three laboratory hours per week. Asst. Prof. Harker.

THESIS AND SEMINAR, MISCELLANEOUS LECTURES, ETC.

- 43s. A thesis, seminar, and lecture course in the theory and practice of medicine and dentistry, applied economics, jurisprudence, psychology, and ethics. One hour a week for one quarter. Arranged by Prof. Lashy.
- 45f. Principles of, and Clinical, Dentistry. Lectures, demonstrations, and practical experience in surgical assisting, dental assisting, dental roentgenology, general anesthesia, operative dentistry, crown and bridge work, dental prosthesis, and orthodontia. Six hours a week for one quarter. Arranged by Miss Jackson.

PREVENTIVE MEDICINE AND PUBLIC HEALTH

- 52f,w,s. Health Care of the Family. First aid; communicable diseases; their transmission and prevention; hygiene of infancy, maidenhood, maturity. The care of the sick room; observation and care of the patient. Elementary symptomatology. Five hours a week for one quarter. Arranged by Assoc. Prof. Diehl.

PSYCHOLOGY

- 1f-2w.† General Psychology. An introductory survey of psychology; its material, fundamental laws, applications, and relations to other sciences. Two lectures, one recitation a week for two quarters. Arranged by Prof. Elliott and staff.

SOCIOLOGY AND SOCIAL WORK

1f,w,s. Introduction to Sociology. A study of the origin and development of human societies; various agencies which have determined the type of social life; social organization, institutions, and progress; bearing of sociology upon other social sciences and arts. Five hours a week for one quarter. Arranged by Prof. Chapin and staff.

Students should retain this bulletin for use throughout the year.

The Bulletin of the University of Minnesota

*College of Engineering and Architecture
and
School of Chemistry
1932-1933*



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FRESHMAN WEEK

The University recognizes the need of giving its newly entering students an introduction to their work and to university life which is new and strange to many of them. For this purpose it is requiring freshmen to come to the University for part of the week before classes begin. This Freshman Week is devoted to efforts to help the freshman get a right start.

The period of September 28 to October 1, inclusive, will be used by the freshman for the following duties:

- a. Making his living arrangements.
- b. Registration and paying his fees.
- c. Physical examinations. (Physical examinations for women are conducted by women physicians.)
- d. Psychological tests.
- e. Other tests or examinations which will enable the faculty to place him in the class for which he is best fitted.
- f. Hearing lectures on such subjects as:
 1. The use of the library.
 2. How to study.
- g. Making visits to acquaint himself with the University Library, scientific laboratories, and other points of interest in connection with his choice of studies and future occupations.
- h. Special exercises intended to acquaint him with the peculiar conditions or requirements of the college which he enters.
- i. Musical and social entertainment in the evenings arranged with the co-operation of the Student Council and the various religious bodies.

During the process of registration faculty advisers talk with all students, helping them to make the best selection of studies.

A committee on educational guidance maintains an office for conference with freshmen regarding their general vocational and educational problems.

Administrative officers, faculty, student government councils, upper class students, and organizations for religious work all co-operate to make Freshman Week a period during which the freshmen find themselves and learn how to go about their university work and how to profit by the opportunities for recreation and other activities in addition to their studies.

NOTE THAT ALL FRESHMEN MUST REGISTER FOR FRESHMAN WEEK ON SEPTEMBER 26 OR 27 AND MUST BE IN ATTENDANCE THROUGHOUT THE FRESHMAN WEEK PERIOD CLOSING ON OCTOBER 1.

It is recommended that as many as possible present themselves for registration on Monday, September 26, in order to avoid the inconvenience and delay incident to the congestion on the last day. All who have not completed the psychological and English tests must report on Monday, September 26.

1932							1933													
JULY							JANUARY							JULY						
Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa
3	4	5	6	7	8	9	1	2	3	4	5	6	7	2	3	4	5	6	7	8
10	11	12	13	14	15	16	8	9	10	11	12	13	14	9	10	11	12	13	14	15
17	18	19	20	21	22	23	15	16	17	18	19	20	21	16	17	18	19	20	21	22
24	25	26	27	28	29	30	22	23	24	25	26	27	28	23	24	25	26	27	28	29
31	..	..	..	..	..	..	29	30	31	..	..	..	..	30	31	..	..	..	..	..
AUGUST							FEBRUARY							AUGUST						
..	1	2	3	4	5	6	..	..	..	1	2	3	4	..	..	..	1	2	3	4
7	8	9	10	11	12	13	5	6	7	8	9	10	11	..	..	1	2	3	4	5
14	15	16	17	18	19	20	12	13	14	15	16	17	18	6	7	8	9	10	11	12
21	22	23	24	25	26	27	19	20	21	22	23	24	25	13	14	15	16	17	18	19
28	29	30	31	..	..	..	26	27	28	..	..	..	..	20	21	22	23	24	25	26
..	..	..	..	..	..	..	..	..	..	..	..	..	..	27	28	29	30	31	..	..
SEPTEMBER							MARCH							SEPTEMBER						
..	..	..	..	1	2	3	..	..	..	1	2	3	4	..	..	..	..	1	2	3
4	5	6	7	8	9	10	5	6	7	8	9	10	11	3	4	5	6	7	8	9
11	12	13	14	15	16	17	12	13	14	15	16	17	18	10	11	12	13	14	15	16
18	19	20	21	22	23	24	19	20	21	22	23	24	25	17	18	19	20	21	22	23
25	26	27	28	29	30	..	26	27	28	29	30	31	..	24	25	26	27	28	29	30
..
OCTOBER							APRIL							OCTOBER						
..	..	..	..	..	..	1	..	..	..	..	..	..	1	1	2	3	4	5	6	7
2	3	4	5	6	7	8	2	3	4	5	6	7	8	8	9	10	11	12	13	14
9	10	11	12	13	14	15	9	10	11	12	13	14	15	15	16	17	18	19	20	21
16	17	18	19	20	21	22	16	17	18	19	20	21	22	22	23	24	25	26	27	28
23	24	25	26	27	28	29	23	24	25	26	27	28	29	29	30	31	..	..	..	..
30	31	..	..	..	..	..	30	..	..	..	..	..	..	..	..	..	..	..	..	..
NOVEMBER							MAY							NOVEMBER						
..	..	1	2	3	4	5	..	1	2	3	4	5	6	..	..	..	1	2	3	4
6	7	8	9	10	11	12	7	8	9	10	11	12	13	5	6	7	8	9	10	11
13	14	15	16	17	18	19	14	15	16	17	18	19	20	12	13	14	15	16	17	18
20	21	22	23	24	25	26	21	22	23	24	25	26	27	19	20	21	22	23	24	25
27	28	29	30	..	..	..	28	29	30	31	..	..	..	26	27	28	29	30	..	..
..
DECEMBER							JUNE							DECEMBER						
..	..	..	..	1	2	3	..	..	..	..	1	2	3	..	..	..	..	..	1	2
4	5	6	7	8	9	10	4	5	6	7	8	9	10	3	4	5	6	7	8	9
11	12	13	14	15	16	17	11	12	13	14	15	16	17	10	11	12	13	14	15	16
18	19	20	21	22	23	24	18	19	20	21	22	23	24	17	18	19	20	21	22	23
25	26	27	28	29	30	31	25	26	27	28	29	30	..	24	25	26	27	28	29	30
..	..	..	..	..	..	..	..	..	..	..	..	..	..	31	..	..	..	..	..	..

UNIVERSITY CALENDAR

1932-33

Fall Quarter

1932			
September	22	Thursday	Payment of fees closes, except for new students
September	26	Monday	Entrance tests
September	26-27		Registration for Freshman Week for all new students entering the freshman class
September	26-30		Examinations for removal of conditions Physical examinations
Sept. 28-Oct.	1		Freshman Week
September	30	Friday	Registration day ¹ for the College of Engineering and Architecture, and the School of Chemistry
			Payment of fees for new students closes
October	3	Monday	Fall quarter classes begin, 8:30 a.m. ²
October	20	Thursday	Senate meeting, 4:30 p.m.
October	29	Saturday	Homecoming Day
November	8	Tuesday	General Election Day; a holiday (except for extension)
November	9	Wednesday	Mid-quarter grades due
November	11	Friday	Armistice Day Convocation
November	24	Thursday	Thanksgiving Day; a holiday
December	1	Thursday	State Day Convocation
December	15	Thursday	Senate meeting, 4:30 p.m.
Dec. 17&19-23			Final examination period
December	22	Thursday	Commencement Convocation
December	23	Friday	Fall quarter ends, 6:00 p.m.
December	31	Saturday	Payment of fees closes at 12 m. for all students in residence fall quarter ³

Winter Quarter

1933			
January	6	Friday	Entrance tests
January	7	Saturday	Registration day ¹ for all students in the College of Engineering and Architecture, and the School of Chemistry
			Payment of fees for new students closes at 12 m.
January	9	Monday	Winter quarter classes begin, 8:30 a.m. ²
February	14	Tuesday	Mid-quarter grades due
February	16	Thursday	Charter Day Convocation
			Senate meeting, 4:30 p.m.
February	22	Wednesday	Washington's Birthday; a holiday (except for extension)
March	20-25		Final examination period

March	23	Thursday	Commencement Convocation Payment of fees closes for all students ³ in residence winter quarter
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March	25	Saturday	Winter quarter ends, 6:00 p.m.
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Spring Quarter

March	31	Friday	Entrance tests
April	1	Saturday	Registration day ¹ for all students in the College of Engineering and Architecture, and the School of Chemistry Payment of fees for new students closes 12 m.

April	3	Monday	Spring quarter classes begin, 8:30 a.m. ²
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April	14	Friday	Good Friday; a holiday (except for ex- tension)
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May	10	Wednesday	Mid-quarter grades due
May	11	Thursday	Cap and Gown Day Convocation

May	18	Thursday	Senate meeting, 4:30 p.m.
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May	30	Tuesday	Memorial Day; a holiday
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June	10&13-17		Final examination period
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June	11	Sunday	Baccalaureate service
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June	12	Monday	Sixty-first annual commencement
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June	17	Saturday	Spring quarter closes, 6:00 p.m.
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Summer Quarter

June	19-20		Registration, first term
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June	21	Wednesday	Summer quarter classes begin, 8:00 a.m.
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July	4	Tuesday	Independence Day; a holiday
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July	27	Thursday	Commencement Convocation
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July	29	Saturday	Registration and payment of fees for second term closes at 12 m.
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First term closes

July	31	Monday	Second term classes begin, 8:00 a.m.
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September	2	Saturday	Second term c'oses
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Entrance Examinations

Entrance examinations for admission to the College of Engineering and Architecture and School of Chemistry will be conducted for students whose credentials do not meet the requirements.

Candidates wishing to take any of these examinations should notify the registrar in writing not later than September 1, December 1, or March 1.

For further information concerning these examinations see "Admission by Examination," page 20.

¹ Registration subsequent to the date specified will necessitate the approval of the college concerned. See also penalty fees for late registration, page 21. No student will be allowed to register in the University later than one week after the beginning of the quarter excepting in unusual cases wherein special circumstances shall justify the appropriate committee of the college concerned permitting registration at a later date.

² First hour classes begin at 8:15 a.m. at University Farm.

³ New students must pay fees on dates announced for registration.

COLLEGE OF ENGINEERING AND ARCHITECTURE
AND SCHOOL OF CHEMISTRY

FACULTY AND STAFF

ADMINISTRATION

- Lotus Delta Coffman, Ph.D., LL.D., President
Ora Miner Leland, B.S., C.E., Dean of the College of Engineering and Architecture and the School of Chemistry
Samuel Colville Lind, Ph.D., Professor of Chemistry and Director of the School of Chemistry
Robert W. French, B.S.(C.E.), Chairman of Students' Work Committee (Engineering and Architecture)
Carl A. Herrick, M.E., Chairman of Registration and Schedule Committees (Engineering and Architecture)
Howard D. Myers, B.S.(C.E.), Chairman of Advanced Standing Committee (Engineering and Architecture)
Hervey H. Barber, Ph.D., Superintendent of Supply and Equipment (Chemistry)
Lillian Cohen, Ph.D., Chairman of Registration and Schedule Committees (Chemistry)
I. William Geiger, Ph.D., Chairman of Advanced Standing Committee (Chemistry)
Norville C. Pervier, Ph.D., Chairman of Students' Work Committee (Chemistry)

AERONAUTICAL ENGINEERING

- John D. Akerman, B.S.(Aero.E.), Professor of Aeronautical Engineering and Head of the Department
Charles Boehnlein, B.S., M.E., Assistant Professor of Aerodynamics
F. Delbridge Knoblock, M.S., Instructor in Aeronautical Engineering

AGRICULTURAL BIOCHEMISTRY

- Ross A. Gortner, Ph.D., Professor of Agricultural Biochemistry and Chief of the Division
William M. Sandstrom, Ph.D., Assistant Professor of Agricultural Biochemistry

AGRICULTURAL ECONOMICS

- Oscar B. Jesness, Ph.D., Professor of Agricultural Economics and Chief of the Division
Andrew Boss, D.Sc., Professor of Farm Management and Vice-Director of Agricultural Experiment Station
Lewis F. Garey, Ph.D., Assistant Professor of Farm Management
Don S. Anderson, B.S.(Agr.), Instructor in Agricultural Economics

AGRICULTURAL ENGINEERING

- William Boss, Professor of Agricultural Engineering and Chief of the Division
Harry B. Roe, B.S.(Eng.), Professor of Drainage and Irrigation

Arthur J. Schwantes, M.S., Associate Professor of Farm Machinery
 Mark J. Thompson, M.S., Associate Professor of Land Clearing
 Jesse H. Neal, M.S.(A.E.), Assistant Professor of Drainage and Irrigation
 Julius Romness, B.A., Assistant Professor of Agricultural Physics
 James B. Torrance, B.S.(Agr.), Assistant Professor of Farm Mechanics
 Arthur G. Tyler, B.S., Assistant Professor of Agricultural Physics
 Hall B. White, M.S., Assistant Professor of Farm Buildings
 Chester L. Berggren, B.S.(Agr.), Instructor in Farm Buildings
 J. Grant Dent, Instructor in Mechanical Training
 Orlando W. Howe, B.S.(A.E.), Instructor in Surveying
 Loren W. Neubauer, B.S.(C.E.), Instructor in Mechanical Drawing
 Lawrence H. Schoenleber, M.S.(Ag.E.), Instructor in Land Clearing

AGRONOMY AND PLANT GENETICS

Herbert K. Hayes, D.Sc., Professor of Plant Genetics and Chief of the Division
 Iver J. Johnson, Ph.D., Assistant Professor of Agronomy and Plant Genetics

ANIMAL HUSBANDRY

Walter H. Peters, M.Agr., Professor of Animal Husbandry and Chief of the Division

ARCHITECTURE

Frederick M. Mann, M.S.(Arch.), C.E., Professor of Architecture and Head of the School of Architecture
 Leon E. Arnal, Architecte Diplôme by the Government of France, Professor of Architectural Design
 S. Chatwood Burton, M.A., Professor of Fine Arts
 Robert T. Jones, B.S.(Arch.), Professor of Architectural Construction
 Roy C. Jones, M.S.(Arch.), Professor of Architectural Design
 Rhodes Robertson,¹ B.A., M.Arch., Associate Professor of Architectural Design
 Ira D. Beals, M.S.(Arch.), Assistant Professor of Architectural Design
 Elmer E. Young, Assistant Professor of Fine Arts
 Ruth Carter, B. Int. Dec., Instructor in Interior Architecture
 David J. Deneen, B.S.(Arch.), Instructor in Architecture
 Ivan Doseff, B.S., Instructor in Drawing and Painting
 Paul M. Havens, B.S.(Arch.), Instructor in Architecture
 Donald C. Heath, M.Arch., Instructor in Architecture
 Arthur R. Nichols, B.S.(Arch.), Lecturer in Landscape Architecture
 Leon H. Sault, B.S.(C.E.), Lecturer in Estimating
 Francis V. Gorman, B.Arch., Assistant in Architecture

ASTRONOMY

Willem J. Luyten, Ph.D., Assistant Professor of Astronomy

BACTERIOLOGY AND IMMUNOLOGY

Winford P. Larson, M.D., Professor of Bacteriology and Immunology and Head of the Department

¹ Absent on leave, 1932-33.

H. Orin Halvorson, Ch.E., Ph.D., Associate Professor of Bacteriology and Immunology
 Beryl S. Green, M.A., Instructor in Bacteriology and Immunology

BOTANY

Carl O. Rosendahl, Ph.D., Professor of Botany and Acting Chairman of the Department
 William S. Cooper, Ph.D., Professor of Botany
 Josephine E. Tilden, M.S., Professor of Botany
 George O. Burr, Ph.D., Associate Professor of Botany
 Frederic K. Butters, B.S., Ph.D., Associate Professor of Botany
 Ned L. Huff, M.A., Assistant Professor of Botany
 Alan E. Trelcar, Ph.D., Assistant Professor of Botany

INORGANIC CHEMISTRY

M. Cannon Sneed, Ph.D., Professor of Inorganic Chemistry and Chief of the Division
 Lloyd H. Reyerson, Ph.D., Professor of Inorganic Chemistry
 Lillian Cohen, Ph.D., Associate Professor of Inorganic Chemistry
 George Glockler, Ph.D., Associate Professor of Inorganic Chemistry
 Hervey H. Barber, Ph.D., Assistant Professor of Inorganic Chemistry and Superintendent of Supply and Equipment
 Norville C. Pervier, Ph.D., Assistant Professor of Inorganic Chemistry
 Henry N. Stephens, Ph.D., Assistant Professor of Inorganic Chemistry
 Gladstone B. Heisig, Ph.D., Instructor in Inorganic Chemistry
 J. Lewis Maynard, M.S., Instructor in Inorganic Chemistry
 Charles E. Bartsch, B.A., Assistant in Inorganic Chemistry
 Melvin Calvin, B.S., Assistant in Inorganic Chemistry
 Charles S. Copeland, B.S.(Chem.), Assistant in Inorganic Chemistry
 Henry M. Davis, M.S., Assistant in Inorganic Chemistry
 John E. Dorn, Jr., B.S., Assistant in Inorganic Chemistry
 Charles L. Faust, B.S.(Ch.E.), M.S.(Chem.), Assistant in Inorganic Chemistry
 Lucille R. Hac, M.S., Assistant in Inorganic Chemistry
 Francis C. Lanning, M.S., Assistant in Inorganic Chemistry
 George E. Lorenz, B.S., Assistant in Inorganic Chemistry
 Charles E. Morrell, M.S., Assistant in Inorganic Chemistry
 Benjamin Moskovitz, B.A., Assistant in Inorganic Chemistry
 George E. Noponen, B.Ch., Assistant in Inorganic Chemistry
 Edgar L. Piret, B.Ch.E., Assistant in Inorganic Chemistry
 F. Lowell Taylor, B.S.(Chem.), Assistant in Inorganic Chemistry
 Lloyd B. Thomas, B.A., Assistant in Inorganic Chemistry
 Isabella M. Webster, B.A., Assistant in Inorganic Chemistry
 Henry C. Yutzy, B.Ch., Assistant in Inorganic Chemistry

ANALYTICAL CHEMISTRY

Isaak M. Kolthoff, Ph.D., Professor of Analytical Chemistry and Chief of the Division
 Charles F. Sidener, B.S., Professor of Analytical Chemistry, Emeritus

I. William Geiger, Ph.D., Associate Professor of Analytical Chemistry
Landon A. Sarver, Ph.D., Assistant Professor of Analytical Chemistry
Ernest B. Sandell, Ph.D., Instructor in Analytical Chemistry
William M. MacNevin, M.A., Assistant in Analytical Chemistry
Romund Moltzau, B.A., Assistant in Analytical Chemistry
August Willman, M.A., Assistant in Analytical Chemistry

ORGANIC CHEMISTRY

Lee I. Smith, Ph.D., Associate Professor of Organic Chemistry and Acting Chief
of the Division
George B. Frankforter, Ph.D., Professor of Industrial Organic Chemistry, Emer-
itus
Walter M. Lauer, Ph.D., Assistant Professor of Organic Chemistry
Paul D. Bartlett, Ph.D., Instructor in Organic Chemistry
C. Frederick Koelsch, Ph.D., Instructor in Organic Chemistry
Russell O. Denyes, B.A., Assistant in Organic Chemistry
Carl M. Langkammerer, B.Ch.E., Assistant in Organic Chemistry
Clinton W. MacMullen, B.Ch.E., Assistant in Organic Chemistry
Sidney E. Miller, B.S., Assistant in Organic Chemistry
Wilbur B. Pings, B.S., Assistant in Organic Chemistry
Pliny O. Tawney, B.S., Assistant in Organic Chemistry
Marvin A. Spie'man, B.S., du Pont Fellow

PHYSICAL CHEMISTRY

Frank H. MacDougall, Ph.D., Professor of Physical Chemistry
Samuel C. Lind, Ph.D., Professor of Photo- and Radio-Chemistry
Robert S. Livingston, Ph.D., Assistant Professor of Physical Chemistry
Nelson W. Taylor, Ph.D., Assistant Professor of Physical Chemistry
John Rehner, Jr., M.A., Assistant in Physical Chemistry
Samuel Yuster, B.S., Assistant in Physical Chemistry
Donald L. Fuller, B.Ch.E., Shevlin Fellow

CHEMICAL ENGINEERING

Charles A. Mann, Ph.D., Professor of Chemical Engineering and Chief of the
Division
Everhart P. Harding, Ph.D., Associate Professor of Technological Chemistry,
Emeritus
George H. Montillon, Ph.D., Professor of Chemical Engineering
Ralph E. Montonna, Ph.D., Associate Professor of Chemical Engineering
Arthur E. Stoppel, Ch.E., Ph.D., Assistant Professor of Chemical Engineering
Fred L. Hovde, B.Ch.E., B.A., Instructor in Chemical Engineering
Burrell F. Ruth, Ph.D., Instructor in Chemical Engineering
John L. Beal, B.Ch.E., Assistant in Chemical Engineering
Kenneth C. Johnson, B.Ch.E., Assistant in Chemical Engineering
Edward E. Litkenhous, B.S.(Ch.E.), Assistant in Chemical Engineering
Ralph E. Peck, B.Ch.E., Assistant in Chemical Engineering

Oscar J. Swenson, B.Ch.E., Assistant in Chemical Engineering
 Charles C. Winding, B.Ch.E., Assistant in Chemical Engineering

CIVIL ENGINEERING

Frederic H. Bass, B.S., Professor of Municipal and Sanitary Engineering and
 Chairman of the Department
 Alvin S. Cutler, C.E., Professor of Railway Engineering
 Fred C. Lang, C.E., Professor of Highway Engineering
 John I. Parcel, B.A., B.S.(C.E.), Professor of Structural Engineering
 Chester A. Hughes, M.A.Sc., Associate Professor of Structural Engineering
 Joseph A. Wise, B.S.(C.E.), Associate Professor of Structural Engineering
 Otto S. Zelner, B.S.(C.E.), Associate Professor of Surveying
 Leonard F. Boon, B.S.(C.E.), Assistant Professor of Civil Engineering
 Russell C. Brinker, B.S.(C.E.), Research Fellow in Structural Engineering
 Earl Felt, B.S.(C.E.), Research Fellow in Highway Engineering
 S. Paul Kingston, B.S.(C.E.), Teaching Fellow in Civil Engineering
 Eldred B. Murer, B.S.(C.E.), Research Fellow in Structural Engineering
 Albert L. Nowicki, C.E., Research Fellow in Civil Engineering

DAIRY HUSBANDRY

Clarence H. Eckles, D.Sc., Professor of Dairy Husbandry and Chief of the
 Division
 Willes B. Combs, M.A., Professor of Dairy Husbandry

DRAWING AND DESCRIPTIVE GEOMETRY

William H. Kirchner, B.S., Professor of Drawing and Descriptive Geometry and
 Head of the Department
 Robert W. French, B.S.(C.E.), Professor of Drawing and Descriptive Geometry
 Leon Archibald, B.Sc., Assistant Professor of Drawing and Descriptive Geometry
 Henry C. T. Eggers, E.E., Ph.D., Assistant Professor of Drawing and Descriptive
 Geometry
 Alex S. Levens, M.S.(C.E.), C.E., Assistant Professor of Drawing and Descrip-
 tive Geometry
 Howard D. Myers, B.S.(C.E.), Assistant Professor of Drawing and Descriptive
 Geometry
 Orrin W. Potter, E.M., M.S., Assistant Professor of Drawing and Descriptive
 Geometry
 Robert F. Schuck, B.S.(E.E.), Assistant Professor of Drawing and Descriptive
 Geometry
 William S. Williams, B.S.(E.E.), Assistant Professor of Drawing and Descriptive
 Geometry
 Charles L. Brainard, B.S.(Arch.), Instructor in Drawing and Descriptive
 Geometry
 Fred T. Cruzen, B.S.(E.E.), Instructor in Drawing and Descriptive Geometry
 Lloyd J. Quaid, B.S.(E.E.), Instructor in Drawing and Descriptive Geometry
 Emmett O. Shultz, B.S.(M.E.), Instructor in Drawing and Descriptive Geometry

ECONOMICS AND BUSINESS ADMINISTRATION

Russell A. Stevenson, Ph.D., Dean of the School of Business Administration
 George Filipetti, Ph.D., Professor of Economics and Adviser in Engineering Pre-Business and Industrial Administration Courses
 Roy G. Blakey, Ph.D., Professor of Economics
 Frederic B. Garver, Ph.D., Professor of Economics
 Alvin H. Hansen, Ph.D., Professor of Economics
 Arthur W. Marget, Ph.D., Professor of Economics and Banking
 Bruce D. Mudgett, Ph.D., Professor of Economics
 J. Warren Stehman, Ph.D., Professor of Economics
 Jeremiah S. Young, Ph.D., Professor of Political Science
 Ernest A. Heilman, Ph.D., Associate Professor of Accounting
 Ralph Cassady, Ph.D., Assistant Professor of Marketing
 Richard L. Kozelka, Ph.D., Assistant Professor of Economics and Statistics
 Walter R. Myers, Ph.D., Assistant Professor of Finance
 Harry J. Ostlund, B.A., Assistant Professor of Accounting
 Emerson P. Schmidt, M.A., Assistant Professor of Economics
 William H. Stead, Ph.D., Assistant Professor of Economics
 Robert M. Weidenhammer, Ph.D., Assistant Professor of Economics
 John P. Dalzell, B.A., LL.B., Lecturer in Business Law
 Harlan L. McCracken, Ph.D., Lecturer in Economics
 Truman W. Manning, M.S., Instructor in Economics
 Ben W. Palmer, M.A., LL.B., Lecturer in Political Science
 Reuel I. Lund, M.A., C.P.A., Instructor in Accounting

ELECTRICAL ENGINEERING

John M. Bryant, M.S., E.E., Professor of Electrical Engineering and Head of the Department
 William T. Ryan, E.E., Professor of Electric Power Engineering
 Franklin W. Springer, E.E., Professor of Electrical Engineering
 Henry E. Hartig, B.S.(E.E.), Ph.D., Associate Professor of Telephone and Telegraph Engineering
 John H. Kuhlmann, B.A., (E.E.), Associate Professor of Electrical Design
 James S. Webb, M.S., Ph.D., Associate Professor of Radio Engineering
 Loyst C. Caverley, M.S.(E.E.), Assistant Professor of Electric Power Engineering
 Elmer W. Johnson, B.S., M.E., E.E., Assistant Professor of Electric Power Engineering
 Milo E. Todd, B.A., E.E., Assistant Professor of Electric Power Engineering
 Cleo Brunetti, B.E.E., Teaching Fellow in Electrical Engineering
 Edward S. Loye, B.E.E., Teaching Fellow in Electrical Engineering
 Alfred O. C. Nier, B.E.E., Teaching Fellow in Electrical Engineering
 Walter A. Specht, B.E.E., Teaching Fellow in Electrical Engineering

ENGLISH

Cecil A. Moore, Ph.D., Professor of English and Chairman of the Department
 Harlow C. Richardson, B.A., Assistant Professor of English, in charge of Engineering English

Luther N. Becklund, B.A., Instructor in English
Ledru O. Guthrie, M.A., Instructor in English
Clifford I. Haga, B.A., Instructor in English
Franz J. Montgomery, M.A., Instructor in English

FORESTRY

Henry Schmitz, Ph.D., Professor of Forestry and Chief of the Division
Edward G. Cheyney, B.A., Professor of Forestry

GENERAL ENGINEERING

Egerton W. Kibbey, LL.B., Lecturer in Engineering Contracts and Specifications

GEOLOGY AND MINERALOGY

William H. Emmons, Ph.D., Professor of Geology and Mineralogy and Head
of the Department
John W. Gruner, Ph.D., Associate Professor of Geology and Mineralogy
George M. Schwartz, Ph.D., Associate Professor of Geology and Mineralogy

GERMAN

Samuel Kroesch, Ph.D., Professor of German and Head of the Department
George F. Lussy, Ph.D., Associate Professor of German
James Davies, Ph.D., Assistant Professor of German
Fred B. Gerstung, M.A., Instructor in German

HORTICULTURE

William H. Alderman, B.S.A., Professor of Horticulture and Chief of the
Division
Wilfrid G. Brierley, Ph.D., Associate Professor of Horticulture
Lewis E. Longley, M.S., Assistant Professor of Horticulture

MATHEMATICS AND MECHANICS

William E. Brooke, B.C.E., M.A., Professor of Mathematics and Mechanics and
Head of the Department
Hans H. Dalaker, Ph.D., Professor of Mathematics and Mechanics
George C. Priester, Ph.D., Professor of Materials of Engineering
Carl A. Herrick, M.E., Associate Professor of Mathematics and Mechanics
Lorenz G. Straub, Ph.D., Associate Professor of Hydraulics
Hugh B. Wilcox, B.S.(E.E.), M.S., Associate Professor of Mathematics and
Mechanics
Charles Boehnlein, B.S., M.E., Assistant Professor of Aerodynamics
Harry A. Doeringsfeld, C.E., Assistant Professor of Mathematics and Mechanics
William M. McClintock, M.A., Assistant Professor of Mathematics and
Mechanics
Forrest E. Miller, M.S., Assistant Professor of Mathematics and Mechanics
Michael A. Sadowsky, Dr.Ing., Assistant Professor of Mathematics and Mechanics
Roderick W. Siler, B.S., Assistant Professor of Mathematics and Mechanics

Charles L. Barker, M.A., M.S., Instructor in Mathematics and Mechanics
 John A. Henry, B.S.(C.E.), Instructor in Mathematics and Mechanics
 Glenn H. Peebles, M.S., Instructor in Mathematics and Mechanics
 Max G. Scherberg, Ph.D., Instructor in Mathematics and Mechanics

MECHANICAL ENGINEERING

John R. DuPriest, B.S.(E.E.), M.E., M.M.E., Professor of Mechanical Engineering and Head of the Department
 Frank B. Rowley, B.S., M.E., Professor of Mechanical Engineering and Director of the Experimental Engineering Laboratories
 Charles F. Shoop, B.S., B.S.(M.E.), Professor of Steam Engineering
 Charles A. Koepke, M.S.(M.E.), Associate Professor of Industrial Engineering and Superintendent of Shops
 John V. Martenis, M.E., Associate Professor of Machine Design
 Burton J. Robertson, B.S., E.E., Associate Professor of Internal Combustion Engines
 Arthur R. Ford, M.S.(M.E.), Assistant Professor of Internal Combustion Engines
 Russell E. Gibbs, B.S.(M.E.), Assistant Professor of Steam Engineering
 William H. Richards, Assistant Professor of Woodworking
 James J. Ryan, M.S.(M.E.), Assistant Professor of Machine Design
 Axel B. Algren, B.S.(M.E.), Instructor in Mechanical Engineering and Assistant Director of the Experimental Engineering Laboratories
 Jesse M. Campbell, B.S.(M.E.), Instructor in Mechanical Engineering
 William H. Easton, B.S.(M.E.), Instructor in Mechanical Engineering
 Thomas P. Hughes, B.S., Instructor in Forging
 John H. Moffett, Met.E., Instructor in Foundry Practice
 Herald K. Palmer, B.S., B.S.(E.E.), Instructor in Mechanical Engineering
 Bruce L. Ray, B.S.(M.E.), Instructor in Machine Shop Practice
 E. H. Spencer Alden, Assistant in Foundry Practice
 Harry N. Martinson, Assistant in Machine Shop Practice
 Carl T. Peterson, Assistant in Woodworking
 Fred Teal, Assistant in Forging
 Leland R. Amundson, B.Arch.E., Research Fellow in Heating and Ventilation
 Harold C. Herrmann, B.M.E., Research Fellow in Heating and Ventilation
 Charles H. Pesterfield, B.S.(M.E.), Research Fellow in Heating and Ventilation
 Anton Schwertfeger, B.S.(M.E.), Research Fellow in Heating and Ventilation

METALLOGRAPHY

Ralph L. Dowdell, Met.E., Ph.D., Professor of Metallography and Head of the Department
 Arthur C. Forsyth, Met.E., M.S., Instructor in Metallography
 Henry S. Jerabek, B.S.(Ch.E.), M.S., Instructor in Metallography

METALLURGY

William R. Appleby, M.A., Professor of Metallurgy and Dean of the School of Mines and Metallurgy
 Peter Christianson, B.S., E.M., Professor of Metallurgy
 Levi B. Pease, M.S., Professor of Metallurgy

MILITARY DEPARTMENT

- John H. Hester, Major, Infantry, Professor of Military Science and Tactics and Head of the Department
- William G. Guthrie, Major, Medical Corps, Assistant Professor of Military Science and Tactics
- Willis Shippam, Major, Coast Artillery Corps, Assistant Professor of Military Science and Tactics and Head of the Coast Artillery Corps Unit
- Theron G. Methven, Major, Infantry, Assistant Professor of Military Science and Tactics
- William C. Webb, Jr., Major Dental Corps, Assistant Professor of Military Science and Tactics
- Hammond D. Birks, Captain, Infantry, Assistant Professor of Military Science and Tactics
- Porter P. Wiggins, Captain, Infantry, Assistant Professor of Military Science and Tactics
- William A. Ellis, Captain, Infantry, Assistant Professor of Military Science and Tactics
- Murray T. Davenport, Captain, Infantry, Assistant Professor of Military Science and Tactics
- Emil Krause, Captain, Infantry, Assistant Professor of Military Science and Tactics
- Rex W. Minckler, Captain, Signal Corps, Assistant Professor of Military Science and Tactics and Head of the Signal Corps Unit
- Richard A. Ericson, First Lieutenant, Coast Artillery Corps, Assistant Professor of Military Science and Tactics
- Vincent J. Conrad, First Lieutenant, Infantry, Assistant Professor of Military Science and Tactics
- Hewitt W. Richmond, First Lieutenant, Coast Artillery Corps, Assistant Professor of Military Science and Tactics
- Harlan N. Hartness, First Lieutenant, Infantry, Assistant Professor of Military Science and Tactics
- Alfred Brandt, Master Sergeant, Infantry, Instructor in Military Science and Tactics
- Harry E. Strider, Master Sergeant, Signal Corps, Instructor in Military Science and Tactics
- Aubrey R. Dunkum, Technical Sergeant, Coast Artillery Corps, Instructor in Military Science and Tactics
- Roy Cunningham, Staff Sergeant, Infantry, Instructor in Military Science and Tactics
- Ernest R. Mylk, Sergeant, Coast Artillery Corps, Instructor in Military Science and Tactics
- Arley V. Buckner, Sergeant, Infantry, Instructor in Military Science and Tactics
- Clayton A. Peterson, Sergeant, Infantry, Instructor in Military Science and Tactics

PHYSICAL EDUCATION FOR MEN

Frank McCormick, LL.B., Professor of Physical Education for Men and Director of Physical Education and Athletics

Bernard W. Bierman, B.A., Professor of Physical Education for Men and Head Football Coach

Louis J. Cooke, M.D., Associate Professor of Physical Education and Athletics for Men

Louis F. Keller, M.A., Associate Professor of Physical Education for Men

David MacMillan, B.S., Assistant Professor of Physical Education for Men

Blaine McKusick, B.A., LL.B., Instructor in Physical Education for Men

Ralph A. Piper, B.Phys.Ed., Instructor in Physical Education for Men

Niels Thorpe, Instructor in Physical Education for Men

PHYSICAL EDUCATION FOR WOMEN

J. Anna Norris, M.D., Professor of Physical Education for Women and Director of Health and Physical Education for Women

Gertrude M. Baker, M.A., Assistant Professor of Physical Education for Women

May S. Kissock, M.A., Assistant Professor of Physical Education for Women

Alice J. H. Tolg, M.D., Assistant Professor of Physical Education for Women

Florence Warnock, B.S., Assistant Professor of Physical Education for Women

Grace Christensen, B.S., Instructor in Physical Education for Women

Josephine Dickson, B.S., Instructor in Physical Education for Women

Mildred Lee, B.S., Instructor in Physical Education for Women

Florence I. Mahoney, M.S., Instructor in Physical Education for Women

Elizabeth Noyes, B.A., Instructor in Physical Education for Women

Catherine Snell, B.S., Instructor in Physical Education for Women

Helen Starr, B.S., Instructor in Physical Education for Women

PHYSICS

Henry A. Erikson, B.E.E., Ph.D., Professor of Physics and Chairman of the Department

Louallen F. Miller, Ph.D., Professor of Physics

John T. Tate, Ph.D., Professor of Physics

Anthony Zeleny, Ph.D., Professor of Physics

J. William Buchta, Ph.D., Associate Professor of Physics

Joseph Valasek, Ph.D., Associate Professor of Physics

Edward L. Hill, Ph.D., Assistant Professor of Theoretical Physics

PHYSIOLOGIC CHEMISTRY

Jesse F. McClendon, Ph.D., Professor of Physiologic Chemistry

Allan Hemingway, Ph.D., Assistant Professor of Physiologic Chemistry

Jesse W. Cavett, Ph.D., Instructor in Physiologic Chemistry

Robert H. Hamilton, Jr., M.A., Instructor in Physiologic Chemistry

PREVENTIVE MEDICINE AND PUBLIC HEALTH

Harold S. Diehl, M.A., M.D., Professor of Preventive Medicine and Public Health and Director of Health Service

J. Arthur Myers, Ph.D., M.D., Professor of Preventive Medicine and Public Health

William A. O'Brien, M.D., Associate Professor of Pathology and Preventive Medicine

Dalmon V. Boardman, M.D., Instructor in Preventive Medicine and Public Health

Meredith Hesdorffer, M.D., Instructor in Preventive Medicine and Public Health

Robert G. Hinckley, M.D., Instructor in Preventive Medicine and Public Health

Bernard A. Watson, M.D., Instructor in Preventive Medicine and Public Health

RHETORIC

(College of Agriculture)

Robert C. Lansing, M.A., Assistant Professor of Rhetoric

William J. Routledge, B.A., Assistant Professor of Rhetoric

Helen Thompson, M.A., Instructor in Rhetoric

Marjorie H. Thurston, M.A., Instructor in Rhetoric

SOILS

Frederick J. Alway, Ph.D., Professor of Soils and Chief of Division

Clayton O. Rost, Ph.D., Associate Professor of Soils

Paul R. McMiller, M.S., Assistant Professor of Soils

SPEECH

Frank M. Rarig, M.A., Professor of Speech and Chairman of the Department

Luverne C. Ramsland, M.A., Teaching Assistant in Speech

ZOOLOGY

Dwight E. Minnich, Ph.D., Professor of Zoology and Chairman of the Department

Ralph Dawson, Ph.D., Assistant Professor of Zoology

GENERAL INFORMATION

COLLEGE OF ENGINEERING AND ARCHITECTURE

The College of Engineering and Architecture had its beginning in the College of Agriculture and the Mechanic Arts which was authorized by the legislative act of 1868. Courses in civil and mechanical engineering were first offered in 1871. In the reorganization of the University, in 1872, the College of the Mechanic Arts was established. It became the College of Engineering, Metallurgy, and the Mechanic Arts in 1892, and the College of Engineering and the Mechanic Arts in 1897. A course in Electrical Engineering was first offered in 1887. Architecture and Architectural Engineering were announced in 1912. In 1916 the college received its present name. In 1925, the name of the Department of Architecture was changed to the School of Architecture. The course in Interior Architecture was established in 1923 being called Interior Decoration until 1929. The Agricultural Engineering course was offered in 1925, and the courses in Aeronautical Engineering and Landscape Architecture in 1928.

The purpose of this college is to give the students a broad foundation in the fundamental principles of engineering and architecture, together with sufficient knowledge of professional practice to enable them to apply those principles successfully. It is not possible in college to educate a fully trained engineer, as the application of the principles to the practice of engineering is to be learned through experience. There are certain subjects, such as surveying and drafting, in which some proficiency is required. This enables a student upon graduation to fill satisfactorily a subordinate position while obtaining a basis for growth and advancement.

It is intended that all of the technical courses given in this college shall be taught by men who have had practical experience in their respective fields in addition to their professional training.

The field of engineering is very broad and is continually becoming more extensive. From the technical lines of design, construction, maintenance, and operation of engineering works, which have always belonged to him, the trained engineer has been drawn into the business world to occupy positions of an executive character. To meet the demand for such service, the importance of the broader training in economic and commercial principles and industrial relations is recognized.

Withal, it is intended that the young graduate shall have obtained material assistance in developing those traits of character which will make him a loyal and exemplary citizen and a true gentleman.

SCHOOL OF CHEMISTRY

The School of Chemistry was established in 1897 as a school of analytical and applied chemistry, subsidiary to the College of Science, Literature, and the Arts. In 1904 it was made a separate unit of the University, and in 1919, its present name was adopted.

It occupies a large modern building, 180 by 200 feet, having six floors. Its laboratories are designed to afford facilities for instruction in the various

branches of chemistry. The chemistry library is well provided with complete sets of journals and compendia of chemical literature, among which are important sets not frequently found in university libraries. Many special laboratories for private research have been provided and facilities are available for graduate work leading to the higher degrees.

COURSES AND DEGREES

The College of Engineering and Architecture offers four-year courses of study in Aeronautical, Agricultural, Architectural,* Civil, Electrical, and Mechanical Engineering, Architecture,* and Landscape Architecture, and a five-year course in Architecture. These courses lead to the degree of bachelor of aeronautical, agricultural, architectural, civil, electrical, or mechanical engineering, or landscape architecture. In some of the courses, optional groups of electives are arranged for the guidance of students who desire to devote special attention to certain fields.

A four-year course in Interior Architecture is provided, of which the first two years are taken in the College of Science, Literature, and the Arts and the last two years in the College of Engineering and Architecture, leading to the degree of bachelor of interior architecture.

The Engineering Pre-Business course requires the first two years of work in this college. This is followed by two years in the School of Business Administration upon the completion of which the degree of bachelor of business administration is conferred.

In co-operation with the College of Science, Literature, and the Arts, a five-year course in Arts and Architecture is offered. It leads to the degrees of bachelor of arts, at the end of four years in the College of Science, Literature, and the Arts, and bachelor of architecture at the end of the fifth year in the College of Engineering and Architecture.

The School of Chemistry offers two courses which lead to degrees, namely, (1) the four-year course in Chemistry, and (2) the course in Chemical Engineering. The former course leads to the degree of bachelor of chemistry. The course in Chemical Engineering leads to the degree of bachelor of chemical engineering at the end of four years, and to the Master's degree in chemical engineering at the end of the fifth year, which is taken in the Graduate School.

These colleges also offer work in the Graduate School leading to the Master's degree in the appropriate branch of engineering, in architecture, or in chemistry, or to the Doctor's degree.

The professional degree of aeronautical, agricultural, chemical, civil, electrical, or mechanical engineer will be conferred upon those who have received the degree of bachelor of aeronautical, agricultural, chemical, civil, electrical, or mechanical engineering, when they have completed the equivalent of one additional year's college work, four years of engineering experience in positions of responsibility, and have presented a satisfactory professional thesis.

Graduates of these colleges may be granted permission to pursue the year of graduate study *in absentia* under the direction of the faculty. It is recommended,

* The four-year courses in Architecture and Architectural Engineering will be discontinued after the present classes graduate, in 1935, to be replaced by the new five-year course in Architecture which is in effect this year, 1932.

however, that this year be spent in residence at this University and that the Master's degree be obtained in this manner. There are many advantages in taking this year immediately following graduation from the four-year course, thus making a five-year course leading to the Master's degree in the corresponding branch of engineering or in architecture. Then after four years of approved experience and the preparation of the professional thesis, the Engineer degree may be obtained. This procedure is especially recommended to those students whose undergraduate work is of high grade and who desire additional preparation for the higher positions which require strong character and leadership.

Candidates for the Engineer degrees register in the Graduate School.

ADMISSION

Detailed information concerning admission, entrance requirements, advanced standing, and expenses will be found in the bulletin of general information which will be sent to any address upon application to the registrar, University of Minnesota.

Students are admitted on certificate or by examination. In special cases, with the approval of the dean of the college, persons of mature age (twenty-four years or older) and experience may be admitted as adult special students to pursue specific courses of study.

Admission by certificate.—Applicants must present twelve units of work obtained in the last three years of high school (senior high school) of which at least nine must be included in Groups A, B, C, D, and E as listed below. These nine units must include a major of three units in one group and two minors of two units each in two other groups. Subject to these requirements, the applicant for admission to Engineering, Architecture, or Chemistry must include at least two units of English and three units of mathematics, including higher algebra and solid geometry. One unit of mathematics and one unit of foreign language taken in the ninth grade may be counted in these groups. Applicants who stand in the upper 60 per cent of their high school class on the basis of their scholastic records, will be admitted directly; those in the lowest 40 per cent will be given individual consideration and may be permitted to take special tests to qualify for admission. Chemistry is required for admission to the School of Chemistry.

Students who expect to enter the College of Engineering and Architecture or School of Chemistry are urged to include in their high school courses additional mathematics, beyond the three years required; Latin, two units; German or French, two units; chemistry, one unit; physics, one unit; ancient, modern, and American history; and American government or civics. French is desirable for students in architecture. German is important for students entering the School of Chemistry.

List of entrance subjects.—Only those subjects included in the following groups may be counted toward admission.

The term *unit* means not less than five recitations of forty minutes each per week for a school year of thirty-six weeks. In laboratory, drawing, and other manual courses, twice this amount of class time is required for one unit.

- Group A English: 1 to 3 units.
- Group B Foreign languages: Latin, Greek, German, French, Spanish, Scandinavian, 1 to 4 units each.
- Group C History and social sciences: European history, $\frac{1}{2}$ to 2 units; English and American history, $\frac{1}{2}$ or 1 unit each; economics and sociology, $\frac{1}{2}$ unit each; American government, commercial geography, and history of commerce, $\frac{1}{2}$ or 1 unit each.
- Group D Mathematics: elementary algebra and plane geometry, 1 unit each; unified mathematics, 2 units; higher algebra, $\frac{1}{2}$ or 1 unit; solid geometry and trigonometry, $\frac{1}{2}$ unit each.
- Group E Natural sciences: biology, physics, and chemistry, 1 unit each; botany and zoology, $\frac{1}{2}$ or 1 unit each; physiology, astronomy, and geology, $\frac{1}{2}$ unit each.
- Group F Vocational and miscellaneous subjects: The three units which are not required to be in Groups A, B, C, D, E, may be in work which the superintendent certifies as being of acceptable nature and as having been counted toward the applicant's graduation.

Admission by examination.—Applicants who are high school graduates or at least nineteen years of age may be admitted provisionally and subject to one year of satisfactory work, upon passing the following tests:

- a. College aptitude test
- b. Test of proficiency in English
- c. Test in mathematics including arithmetic, algebra, and geometry
- d. Test in chemistry, if entering School of Chemistry.

Applicants failing to pass test (b), (c) or (d) may apply for a subsequent examination at any scheduled date on payment of a fee of five dollars. Those failing to pass test (a) may enter only upon satisfactorily meeting the entrance requirements by the certificate method.

Time of admission.—The regular time to enter the college is in September. However, students will be admitted at the beginning of the winter quarter in January; then by attending the following summer quarter it is possible to complete most of the work of the freshman year. Admission at the opening of the spring quarter is permitted altho a full regular program of work will not usually be obtainable.

ADVANCED STANDING

Students who have pursued courses of study in other colleges of recognized standing may receive advanced credit under the rules of the University and of the college. See Requirements for Graduation.

Students who have taken college algebra or trigonometry in high school with satisfactory records may be permitted to take comprehensive examinations for credit in these subjects, if they apply before registration day.

REGISTRATION

All undergraduate students are required, at the beginning of each quarter of residence, to pay the prescribed fees to the university bursar, to fill and file at the Main Engineering Building (Chemistry Building for students registering in School of Chemistry) the necessary classification blanks showing the courses they expect to pursue during the quarter, and to enroll for their various classes.

All students entering the college for the first time must send or present their credentials to the registrar of the University, who will notify each applicant with

regard to his admission. Before registering, all new matriculants are required to take a physical examination.

Students should consult the university calendar in regard to registration dates and the *Handbook for Students in the College of Engineering and Architecture* or *Handbook for Students in the School of Chemistry* for regulations governing registration and scholastic work.

Students will not be allowed to register for more than 19 credit hours without the approval of the Students' Work Committee.

No change in registration will be permitted later than 7 days after the beginning of the quarter.

FEES AND EXPENSES

The annual fee for students in this college is \$90 for residents and \$120 for non-residents, one third of which is due at the beginning of each quarter. Fellows, scholars, assistants, and instructors are not required to pay university fees or tuition when they are regularly enrolled in the Graduate School.

Tuition fee (per quarter):	
Residents of Minnesota	\$30.00
Non-residents	40.00
Matriculation deposit* (first quarter only)	
Men	15.00
Women	5.00
Incidental fee, per quarter	6.40
Special fees:	
Examination for removal of condition	1.00
Examination for credit (after the first quarter in residence)	5.00
Special examination	5.00
Chemistry deposit, including laboratory fee of \$2.00 per quarter	5.00
Graduation fee	10.00

Penalty fees.—A penalty fee for late registration, or late payment of fees shall be \$2 prior to the day classes begin, on and after which the penalty increases at the rate of \$1 per day, provided that no student shall pay more than \$10 of penalty in any given quarter.

A penalty fee of three dollars (\$3) is charged for change of registration beginning the third day after classes begin. After this date the penalty will increase at the rate of one dollar (\$1) per day to a maximum of ten dollars (\$10).

Living expenses.—Detailed statements regarding living expenses may be found in the bulletin of general information.

THE UNIT OF CREDIT

The standard unit of credit in the University is the quarter credit, or simply, the *credit*. It corresponds to one class period per week for one quarter. This class period may be a one-hour lecture or recitation, or a two- or three-hour class in laboratory, drawing, surveying, or computations, but in any case one credit is supposed to require three actual hours of the average student's time per week for one quarter. One hour of recitation is assumed to require two hours of

* Such charges as may be incurred for lockers, library penalties, laboratory breakage, etc., will be deducted from the amount of this deposit and the balance will be refunded by mail upon graduation or after the beginning of the first quarter the student fails to return to the University.

preparation or study. A two-hour laboratory period may require one hour of home work to complete the credit. A three-hour period usually carries one credit without additional work outside of class. The credit allowed for a lecture may be from one-third to one hour depending upon the amount of outside work or study required in connection with it.

CREDIT FOR OUTSIDE WORK

Credit for certain courses, as a result of work done outside of the regular classes, may be obtained by satisfactorily passing comprehensive examinations. This includes work done in extension classes, by correspondence, by the aid of a private tutor, by individual study, through practical experience, or otherwise.

The comprehensive examination will be of such thoro and searching character as to determine whether the student has done all the work of the course. It should require at least three times the work of the usual final or condition examination and will be conducted by a committee appointed by the head of the department in which the course is given.

Permission to take the examination must be obtained from the Students' Work Committee, and the usual fee of \$5 for each special examination must be paid unless it be taken within six weeks after first entering the University.

EXTENSION COURSES

Certain courses in engineering, architecture, and chemistry are offered by the Extension Division of the University in evening classes and by correspondence. Persons who are unable to attend the regular university courses may obtain valuable instruction in this manner.

Credit for certain required courses in the College of Engineering and Architecture or the School of Chemistry on the basis of work done in the Extension Division is obtainable on petition by passing a comprehensive examination in each course given by the department concerned. A fee of five dollars (\$5) is charged for each examination except when taken within six weeks after admission. Definite information regarding extension work will be found in the bulletins of the General Extension Division.

ATTENDANCE

It is expected that all students will be regular in attendance at all class exercises and that they will do all the work of their courses. Neglect of work, as indicated by irregularity in attendance or low scholarship, will be sufficient reason for exclusion from class. "Any student who has unexcused absences equal to the number of credits in a course, but in no case less than two, shall be dropped from the class with a record of failure in the course." *Senate, May 11, 1921.*

JUNIOR RULE IN ENGINEERING AND ARCHITECTURE

In the College of Engineering and Architecture every student must complete 90 credits, including all the work of the freshman year, and must not lack more than 12 credits of the required (non-elective) courses of his sophomore year before he will be allowed to register for any junior or senior courses in his curriculum.

JUNIOR REVIEW EXAMINATIONS IN CHEMISTRY

The Junior Review Examinations, courses Inorganic Chemistry 51 and 52, and Analytical Chemistry 53, are required of all students registered in the School of Chemistry, but not of students in other colleges who may be taking chemistry courses. The following rules apply only to students registered in the School of Chemistry.

1. The requirement of the three Junior Review Examinations must be satisfied before registration for any required courses of the student's senior year or the summer courses in chemical manufacture (Ch.E. 151-152) or the senior courses in the minor groups in bacteriology, biochemistry, or geology.

2. They will be held regularly at the beginning of the fall, winter, spring, and summer quarters, on the day before registration. They need not be taken simultaneously, but each must be preceded by Analytical Chemistry 1 and 2, Quantitative Analysis.

3. Students who have taken their general inorganic courses, qualitative courses, and quantitative courses in the School of Chemistry and with an average in any of these subjects higher than "C," will be excused from the Junior Review Examination in the corresponding subject.

4. Students may be conditioned or failed in one or more of the Junior Review Examinations. To remove a condition a student must pay the usual fee of \$1 for this examination. This examination would be taken at the next regular Junior Review Examination period, namely the day before registration for the next quarter. The usual fee of \$5 must be paid for permission to repeat any Junior Review Examination in which a failure has been received.

5. Students who transfer to the School of Chemistry from another college or another institution will be required to take and pass the Junior Review Examinations in those subjects for which they have received advanced standing, before entering the courses specified in Rule 1.

CHEMICAL ENGINEERING INSPECTION TRIP

All seniors registered in Chemical Engineering are required to go on a trip of inspection and observation through certain large industrial plants. This trip is usually taken during the spring vacation and is under the personal supervision and guidance of members of the faculty. It includes plants in Milwaukee, Chicago, and near-by points. The expenses of the trip are minimized as far as possible, and must be defrayed by the individual student. They amount to from \$75 to \$100 per student.

REQUIREMENTS FOR GRADUATION

To be recommended for the degree of bachelor of aeronautical, architectural, civil, electrical, or mechanical engineering, of architecture (4-year course), or of landscape architecture, the student must satisfactorily complete all of the courses prescribed in the corresponding curriculum together with sufficient electives to make a total of at least 204 credits. In the new 5-year course in architecture, 225 credits are required for graduation. In agricultural engineering and chemistry, 210 credits are required for graduation. For the degree of bachelor of interior

architecture, the requirements are 195 credits, including all required courses, plus 93 honor points. For the degree of bachelor of chemical engineering, 218 credits are required.

In cases of continued low scholarship, even tho all the courses of the curriculum have been passed, the faculty reserves the right to require additional work to be completed, over and above the regular curriculum, and with a specified grade, before the degree will be recommended.

Students entering the College of Engineering and Architecture or School of Chemistry with advanced standing from other colleges or universities must spend at least one year in residence here before they will be recommended for graduation. If the term of residence is only one year it must be the senior year; and in any case such a student must spend two "quarters" of his senior year in residence.

SCHOLARSHIPS AND PRIZES

Research fellowships.—In the Engineering Experiment Station there are several research fellowships which are open to engineering graduates, including chemical engineers. The holder is required to give twenty hours per week, that is, about half of his time, to such research service as may be assigned him. In addition he is expected to carry half-time work in the Graduate School toward an advanced degree.

Teaching fellowships in civil and electrical engineering are open to graduates in these fields. Each fellow renders part time service in instruction while pursuing graduate study.

The Shevlin Fellowship in Chemistry.—The Shevlin Fellowship in Chemistry, established by the late Thomas H. Shevlin, of Minneapolis, is awarded annually and yields \$500. Candidates for this fellowship should file their applications before March 1 with the dean of the Graduate School. The Shevlin fellow devotes his entire time to graduate work and is not required to render any service to the University.

The du Pont Fellowship in Chemistry.—This fellowship was founded by E. I. du Pont de Nemours and Company, Wilmington, Delaware, and yields \$750 annually. The holder devotes his entire time to graduate work and is not required to render any service to the University. Applications for this fellowship should be submitted to the dean of the School of Chemistry before March 15.

The Albert Moorman Memorial Fellowship in Architecture.—This covers the traveling expenses of the recipient on a trip to study notable examples of architecture in this country. It is awarded for excellence in architectural design as determined by competition in the senior class. (Not offered in 1932-33.)

Assistants.—The School of Chemistry employs thirty assistants at \$650 to \$750 per annum. They are required to devote twelve hours per week to instruction and other assigned work. They thereby obtain valuable experience in laboratory teaching under competent direction. In addition to these duties, each assistant is expected to pursue graduate work toward a higher degree. Application should be made to the dean of the School of Chemistry.

Prizes.—Various prizes in the University are open to students in these colleges. A list of them is given in the general information bulletin. Certain prizes are awarded to students in Engineering only, such as the prizes of the

Northwestern Section of the American Society of Civil Engineers and the Twin Cities sections of the American Society of Mechanical Engineers. The Tau Beta Pi, Chi Epsilon, Eta Kappa Nu, and Pi Tau Sigma honorary engineering fraternities also offer prizes.

Two prizes are open to sophomores in chemistry and chemical engineering. These have been established by the Phi Lambda Upsilon honorary chemical fraternity and the Twin City Alumni Association of the Alpha Chi Sigma chemical fraternity. The chemistry faculty offers a prize to seniors.

Twelve prizes and two medals are open to students registered in the School of Architecture. Medals are offered by the American Institute of Architects, Alpha Rho Chi, and the Scarab Fraternity. The prizes were established respectively by the Minnesota section of the American Institute of Architects, the faculty of the school, Magney and Tusler of Minneapolis, Mr. William A. French of Minneapolis, Alpha Alpha Gamma Sorority, the Gargoyle Club, and the Northern States Power Company.

Loan funds.—Various loan funds are available from which worthy students may obtain financial assistance after they have been in attendance a sufficient length of time to establish satisfactory records of accomplishment. Application should be made to the dean of student affairs.

RESERVE OFFICERS TRAINING CORPS

The War Department has established at this University units of infantry, coast (anti-aircraft) artillery, signal corps, medical corps, and dental corps in which both basic and advanced courses are given. The artillery and signal corps units are made up almost entirely of students in engineering, architecture, chemistry, and mines, for whom this technical and military training is particularly valuable. The basic course is required for the first two years; the advanced course is elective for the third and fourth years.

Students in this college may enroll in the advanced course of the infantry, signal corps, or artillery under the prescribed regulations, and receive for this work eighteen elective credits toward graduation. They receive an allowance of cash and clothing from the government during the two years of the course, pay and transportation to attend a special training camp in the summer, and if successful, a commission in the Reserve Corps of the U. S. Army after graduation. Special arrangements may be made in the student's program to enable him to take this course, the advantages of which are recognized.

SELF-SUPPORT AND OUTSIDE ACTIVITIES

A large number of students contribute to their financial support by means of part time work during the college year. Frequently such students undertake too much. They are advised to carry a lighter program of studies and to plan to spend more than four years in the college course if outside work requires a large amount of their time. Information regarding work for self-support during the college course may be obtained from the University Employment Service or the University Young Men's Christian Association.

Freshmen, in particular, are advised that the work of the first year in this college will require their closest attention and application if they are to succeed.

They should refrain from participation in unnecessary outside activities, while bearing in mind the importance of physical as well as mental development.

HANDBOOK FOR STUDENTS

Regulations and instructions for the guidance of students are issued at the time of registration in the form of a small pamphlet. Each student is expected to observe these instructions.

CHANGES IN BULLETIN

The faculties of the College of Engineering and Architecture and the School of Chemistry reserve the right to change their curricula and to cancel or change without notice any course printed in this bulletin. The bulletin is a statement of present conditions, and is subject to modification in any particular by faculty action.

SOCIETIES

Branches of the following national professional societies are maintained at the University of Minnesota by students and faculty members: American Chemical Society, American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, and American Society of Agricultural Engineers. In addition there are the Architectural Society and the Minnesota Society of Aeronautical Engineers.

CURRICULA

COLLEGE OF ENGINEERING AND ARCHITECTURE

Aeronautical Engineering, p. 28	Electrical Engineering, p. 49
Agricultural Engineering, p. 30	Engineering Pre-Business, p. 59
Architecture, pp. 34 and 37	Interior Architecture, p. 52
Architectural Engineering, p. 39	Landscape Architecture, p. 55
Civil Engineering, p. 47	Mechanical Engineering, p. 56
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SCHOOL OF CHEMISTRY

Chemistry, p. 42	Chemical Engineering, p. 45
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FRESHMAN YEAR

The freshman year for the courses in Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering and Engineering Pre-Business is shown on page 27. The freshman year for Architecture, is shown on page 34, for Landscape Architecture on page 54, and for Chemistry and Chemical Engineering on page 40.

Chemistry.—Students entering the College of Engineering and Architecture who have not had high school chemistry will take Inorganic Chemistry 14f-15w, five credits per quarter, instead of Inorganic Chemistry 4f-5w, four credits per quarter.

Military Science and Tactics.—Students who, for any reason, are not required to take military science and tactics for their freshman and sophomore years, must take physical education both years and without credit. This applies to women and foreign students, as well as others.

REGULAR FRESHMAN PROGRAM

(For Aeronautical, Agricultural,* Civil, Electrical, and Mechanical Engineering, and Pre-Business*)

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 11	College Algebra	5	5	..	..
Inorg. Chem. 4	Inorganic Chemistry	4	1	3	3
Engl. 4	Rhetoric and Composition	3	3	..	..
Draw. 1	Engineering Drawing	3	..	..	8
M.E. 11, 12, or 13*	Shop Practice (for Agr.E. and Pre-bus.)....	2	..	1	4
G.E. 11	Orientation	0	..	1	..
Mil. Sci. 1	First Year Basic Course.....	0	..	..	3
<i>Winter Quarter</i>					
M.&M. 12	Trigonometry	5	5	..	..
Inorg. Chem. 5	Inorganic Chemistry	4	1	3	3
Engl. 5	Rhetoric and Composition	3	3	..	..
Draw. 2	Engineering Drawing	3	..	..	8
M.E. 11, 12, or 13*	Shop Practice (for Agr.E. and Pre-bus.)....	2	..	1	4
G.E. 12	Orientation	0	..	1	..
Mil. Sci. 2	First Year Basic Course.....	0	..	..	3

* Freshmen in Agricultural Engineering and Engineering Pre-Business are required to take Shop Practice, M.E. 11, 12, and 13, 2 credits per quarter; not required of the others.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.&M. 13	Analytical Geometry	5	5	..	..
Inorg. Chem. 16	Qualitative Analysis	5	..	3	6
Engl. 6	Rhetoric and Composition	3	3	..	..
Draw. 3	Descriptive Geometry	3	..	..	8
M.E. 11, 12, or 13*	Shop Practice (for Agr.E. and Pre-bus.).....	2	..	1	4
P.H. 12†	Hygiene and First Aid.....	0	..	1	..
Mil. Sci. 3	First Year Basic Course	0	..	..	3

AERONAUTICAL ENGINEERING

Four-year course leading to the degree of bachelor of aeronautical engineering, B.Aero.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation.

The course in aeronautical engineering is intended to provide instruction and training for students who wish to enter this field of engineering as a profession. With the rapid development of aviation in recent years, aeronautical engineering is assuming a prominent and important position among the engineering professions. The production of airplanes in the United States is increasing at a rapid rate. More attention is being given to lighter-than-air craft as well. Aeronautical engineers are required in all stages of the process, from the research work preliminary to improvements in design to the actual construction, testing, operation, and maintenance.

The aeronautical engineering course is similar to mechanical engineering. The fundamental studies are the same. As a result, the graduates in aeronautical engineering should be prepared to enter various branches of the mechanical engineering field if, for any reason, they should prefer to do so.

The first year of the course is the same as that of civil, electrical, and mechanical engineering.

As in other technical courses, so in aeronautical engineering, mathematics plays an important part. No student should enter this course who feels poorly prepared in mathematics.

It should be understood that this is a professional engineering course and not a training course for airplane pilots. It deals with the preparation of students for research, design, construction, operation, management, and maintenance of aircraft from the standpoint of the engineer or manager. However, practical flight training is important for aeronautical engineers and students are urged to take advantage of their opportunities to obtain it.

The sophomore course in aviation serves as the ground school course of training for the Air Reserve Corps of the U. S. Navy, and upon graduation, properly qualified students may be accepted for actual flight training, leading to a commission in the Naval Reserve.

For freshman year, see page 27.

* Freshmen in Agricultural Engineering and Engineering Pre-Business are required to take Shop Practice, M.E. 11, 12, and 13, 2 credits per quarter; not required of the others.

† Hygiene course for women is included in Phys.Ed. 1f for Women.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 24	Differential Calculus	5	5	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory.....	1	..	..	2
Draw. 28‡	Drafting	2	..	..	6
Aero.E. 1	Aviation	3	3	..	..
M.E. 14	Pattern Practice	2	..	1	4
M.E. 19	Mechanical Technology	1	..	2	..
Mil. Sci. 4	Second Year Basic Course.....	0	..	..	3
<i>Winter Quarter</i>					
M.&M. 25	Integral Calculus	5	5	..	..
Phys. 23	Heat	3	1	3	..
Ph. s. 24	Heat Laboratory	1	..	..	2
Phys. 33	Optics	3	1	3	..
Ph. s. 34	Optics Laboratory	1	..	..	2
Aero.E. 2	Auto and Airplane Engines.....	3	3	..	..
M.E. 16	Forge Practice	2	..	1	4
Mil. Sci. 5	Second Year Basic Course.....	0	..	..	3
<i>Spring Quarter</i>					
M.&M. 26	Technical Mechanics (Statics)	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
Aero.E. 3	Aviation	3	3	..	..
C.E. 17	Surveying	3	..	1	7
Draw. 29	Drafting	2	..	..	6
Mil. Sci. 6	Second Year Basic Course.....	0	..	..	3

JUNIOR YEAR

<i>Fall Quarter</i>					
M.&M. 129	Hydraulics	4	3	1	..
M.&M. 143	Hydraulic Laboratory	1	..	..	2
Aero.E. 100	Aerodynamics	3	3	..	..
M.E. 30	Steam Engineering	3	3	..	..
M.E. 33	Elementary Mechanical Laboratory.....	2	..	..	4
M.E. 71	Machine Shop Practice	3	..	1	7
	Electives*				
<i>Winter Quarter</i>					
M.&M. 128	Strength of Materials	5	5	..	..
M.&M. 141	Materials Testing Laboratory	2	..	1	3
Aero.E. 101	Aerodynamics	3	3	..	..
M.E. 26	Mechanism and Kinematics	3	3	..	..
M.E. 31	Thermodynamics	3	2	..	3
	Electives*				

* For list of elective courses in other colleges, see page 62.

‡ For permissible substitute, see page 61.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.&M. 127	Technical Mechanics (Dynamics).....	5	5	..	..
Aero.E. 83	Stresses in Simple Structures	3	..	1	7
Aero.E. 102	Aerodynamics	3	3	..	..
M.E. 27	Machine Design	3	..	1	6
M.E. 32	Thermodynamics	3	2	..	3
	Electives*				
SENIOR YEAR					
<i>Fall Quarter</i>					
E.E. 46	Electric Power	3	2	..	2
M.E. 150	Internal Combustion Engines	3	3	..	..
Met. 152	Metallography	3	..	2	3
Aero.E. 115	Airplane Stresses	3	2	..	2
Aero.E. 120	Airplane Design	2	1	..	3
Aero.E. 140	Aeronautical Laboratory	2	..	..	6
Aero.E. 190	Seminar	1	1	..	..
	Electives*				
<i>Winter Quarter</i>					
E.E. 47	Electric Power	3	2	..	2
M.E. 151	Internal Combustion Engines	3	3	..	..
M.E. 154	Design of Internal Combustion Engines.....	2	..	..	6
Aero.E. 121	Airplane Design	4	2	..	6
Aero.E. 141	Aerodynamics Laboratory	2	..	..	6
Aero.E. 191	Seminar	1	1	..	..
<i>Spring Quarter</i>					
E.E. 48	Electric Power	3	2	..	2
M.E. 158	Aero Engine Testing	2	..	..	6
Aero.E. 122	Airplane Design	3	1	..	6
Aero.E. 160	Airships	3	2	..	3
Aero.E. 170	Air Transport	2	2	..	..
Aero.E. 192	Seminar	1	1	..	..
	Electives*				

AGRICULTURAL ENGINEERING

Four-year course leading to the degree of bachelor of agricultural engineering, B.Agr.E., in co-operation with the College of Agriculture, Forestry, and Home Economics.

Requirements for graduation include all prescribed courses with sufficient approved electives to make a total of at least 210 credits. This is an average of 17½ credits per quarter for 12 quarters.

Agricultural engineering activities are usually grouped under the heads of *farm machinery*, *farm structures*, and *reclamation*. There is also need for service in the entire field necessitating general preparation in all three lines.

The farm machinery field covers the selection and proper operation of machinery and equipment best suited to produce good results locally on any given type of farm, the design and construction of such machinery or equipment where it does not yet exist, the improvement of such design to meet special needs, and

* For list of elective courses in other colleges, see page 62.

the adaptation of available types of power to local farm conditions. The farm structures field covers arrangement of the structures on the farmstead for economy, convenience, and comfort, the design and construction of farm buildings and related structures, and the adaptation of available types of building materials to local farm conditions. The reclamation field covers development of virgin lands suited to agriculture and the improvement of lands already under cultivation through economical clearing operations, and soil conditioning through efficient design and proper installation of drainage and irrigation works and control of soil erosion.

The field, as yet comparatively new and uncrowded, offers many opportunities among which the following are prominent: with manufacturers of farm machinery, equipment, and building materials; as executives, research engineers, publicity and sales managers, and technical field experts; as managers of large farms requiring extensive machinery or equipment; as reclamation engineers with the local, state, and federal governments, and with development companies; as agricultural advisers with power companies in development of rural service; as agricultural engineering editors for farm papers and trade journals; as rural architects and builders; as teachers, investigators, and extension specialists in state agricultural colleges, experiment stations, and in the United States Department of Agriculture; as consulting agricultural engineers in general practice.

For freshman year, see page 27.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M & M. 24	Differential Calculus	5	5	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory.....	1	..	..	2
Ag.E. 19	Elementary Surveying	3	..	2	4
Ag.E. 43	Mechanical Laboratory	3	..	1	5
Ag.E. 91	Agendum	0	..	1	..
Hort. 6	Fruit Growing	3	..	2	4
Mil. Sci. 4	Second Year Basic Course	0	..	..	3
<i>Winter Quarter</i>					
M & M. 25	Integral Calculus	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Ph s 44	Electricity Laboratory	1	..	..	2
Ag.E. 5	Farm Building Design and Construction.....	3	..	1	4
Ag.E. 92	Agendum	0	..	1	..
Soils 6	Soils	5	5	..	..
Mil. Sci. 5	Second Year Basic Course.....	0	..	..	3
<i>Spring Quarter</i>					
M & M. 84 †	Technical Mechanics	5	5	..	..
Ag.E. 7	Farm Structures, I	3	1	1	3
Ag.E. 12	Field Machinery	3	..	2	3
Ag.E. 13	Gas Engines	3	..	2	4
Ag.E. 20	Advanced Surveying	3	..	2	4
Ag.E. 93	Agendum	0	..	1	..
Mil. Sci. 6	Second Year Basic Course.....	0	..	..	3

† For permissible substitutes, see page 61.

JUNIOR YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 128	Strength of Materials.....	5	5	..	..
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
Econ. 8	General Economics	3	3	..	..
Ag.E. 14	Tractors	3	..	2	4
Ag.E. 71	Power Machinery	3	..	2	3
Ag.E. 94	Agendum	0	..	1	..
<i>Winter Quarter</i>					
M.&M. 86‡	Hydraulics	2	2	..	..
M.&M. 143	Hydraulic Laboratory	1	..	..	2
Econ. 9	General Economics	3	3	..	..
Ag.E. 31	Principles of Drainage	3	1	2	..
Ag.E. 37	Rural Sanitation	3	..	3	..
Ag.E. 72	Applied Electricity	3	..	1	6
or					
Soils 108	Physical Properties of Soils.....	3	..	1	6
M.E. 26	Mechanism and Kinematics	3	2	1	..
Ag.E. 95	Agendum	0	..	1	..
<i>Spring Quarter</i>					
Agron. 1	General Farm Crops	3	..	2	4
or					
A.H. 15	Fundamentals of Livestock Production.....	3	..	2	4
C.E. 37	Structural Engineering	3	..	1	7
D.H. 7	Elements of Dairying	3	..	3	..
M.E. 27	Machine Design	3	..	1	6
Econ. 28	Business Law	3	3	..	..
Ag.E. 42	Principles of Irrigation	3	1	2	..
Ag.E. 96	Agendum	0	..	1	..

SENIOR YEAR

<i>Fall Quarter</i>					
C.E. 51	Highways and Pavements	3	..	2	3
C.E. 146	Plain Concrete	3	..	2	4
Geol. 5	Engineering Geology	3	..	3	..
Ag.E. 70	Steam Boilers and Engines.....	3	..	3	..
Ag.E. 97	Agendum	0	..	1	..
	Electives to complete program.				
<i>Winter Quarter</i>					
Soils 108	Physical Properties of Soils	3	..	1	6
or					
Ag.E. 72	Applied Electricity	3	..	1	6
Ag.Econ. 102	Farm Management: Organization.....	3	..	3	..
G.E. 101	Contracts and Specifications	3	..	3	..
Rhet. 22	Public Speaking	3	3	..	..
Ag.E. 98	Agendum	0	..	1	..
	Electives to complete program.				

‡ For permissible substitutes, see page 61.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
Ag.Ec. 103	Farm Management: Operation	3	..	3	..
Ag.E. 150	Seminar	2	2	..	..
Agron. 1	General Farm Crops	3	..	2	4
or					
A.H. 15	Fundamentals of Livestock Production.....	3	..	2	4
G.E. 193	Engineering Practice	2	..	2	..
Ag.E. 99	Agendum	0	..	1	..
	Electives to complete program.				

RECOMMENDED ELECTIVES

The following courses are suggested for the guidance of students who wish to elect work along the general lines indicated.

Farm Structures

Ag.E. 67s	Farm Structures II	3			
Ag.E.111f,112w,113s	Farm: Building Problems, per quarter.....	3-6			
For. 27w	Farm Woodlots and Windbreaks.....	3			
Hort. 77w	Principles of Landscape Design	3			

Farm Mechanics

Ag.E. 15f	Ignition and Carburetion	3			
Ag.E. 28w	Land Clearing	3			
Ag.E. 40f,s	Mechanical Training I.....	3			
Ag.E. 101f	Drainage Engineering and Works.....	3			
Ag.E.121f,122w,123s	Farm Power and Machinery Problems, per quarter.....	3-6			
Ag.E. 126s	Selection of Farm Equipment	3			
E.F. 43f,44w,45s	Electric Power, per quarter	3			

Reclamation

Ag.E. 28w	Land Clearing	3			
Ag.E. 68f	Drainage Engineering and Works.....	3			
Ag.E.101f,102w,103s	Advanced Drainage Problems, per quarter.....	3-6			
Ag.E. 69s	Irrigation Engineering and Works.....	3			
C.E. 161f	Hydrology	3			
Hort. 77w	Principles of Landscape Design.....	3			

ARCHITECTURE

(The following statement applies to students entering in the fall of 1932. Students who entered before that time will follow the curricula in Architecture and Architectural Engineering for the sophomore, junior, and senior years as shown on pages 37 to 40.)

Five-year course leading to the degree of bachelor of architecture, B.Arch. In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 225 credits.

The curriculum leading to the degree of bachelor of architecture is intended for students who expect to enter the professional practice of architecture in any of its recognized phases. It provides a basis of both general and technical training, which, when supplemented by practical experience in architects' offices, places the

student in line for recognition as a practicing architect according to the registration laws of the various states.

The total requirements for the degree include certain minima in design, construction, engineering, history, and drawing which are necessary to an all-round understanding of architecture, and which are required of all students. They also include certain flexible electives through which each student may supplement his basic work by more concentrated effort along the lines of his special interests, whether in design or construction (including what is understood as "architectural engineering") in his later years. Completion of the requirements for the degree is arranged on a five-year basis for the normal student. Students who are especially qualified by ability, experience, or advanced standing through transfer from other institutions may shorten this time.

Students who wish further to broaden their training may arrange a combined program of work which complies, first, with the requirements for the B.A. degree, with a major in architecture, offered by the College of Science, Literature, and the Arts, and second, with the requirements of a bachelor of architecture degree in the College of Engineering and Architecture.

FIVE-YEAR COURSE BEGINNING IN THE FALL OF 1932

FRESHMAN YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 11	College Algebra	5	5	..	..
Engl. 4	Rhetoric and Composition	3	3	..	..
Arch. 11	Introduction to Architecture	1	..	1	..
Arch. 21	Freehand Drawing	2	..	..	6
G.E. 11	Orientation	0	..	1	..
Mil. Sci. 1†	First Year Basic Course	0	..	..	3
Also one of the following courses:					
In.Chem. 1	General Inorganic Chemistry, or.....	4	..	3	4
Hist. 1	Modern World, or	5	2	3	..
French 1	Beginning French	5	5	..	..
<i>Winter Quarter</i>					
M.&M. 12	Trigonometry	5	5	..	..
Engl. 5	Rhetoric and Composition	3	3	..	..
Arch. 12	Introduction to Architecture	1	..	1	..
Arch. 22	Freehand Drawing	2	..	..	6
G.E. 12	Orientation	0	..	1	..
Mil. Sci. 2†	First Year Basic Course	0	..	..	3
Also continuation of:					
In.Chem. 2	General Inorganic Chemistry, or	4	..	3	4
Hist. 2	Modern World, or	5	2	3	..
French 2	Continuation French	5	5	..	..

† Women take Phys.Ed. for Women, Phys.Ed. 1, 2, 3 in place of Mil.Sci. 1, 2, 3 and P.H. 12.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.&M. 13	Analytical Geometry	5	5	..	..
Engl. 6	Rhetoric and Composition	3	3	..	..
Arch. 13	Introduction to Architecture	1	..	1	..
Arch. 23	Freehand Drawing	2	..	..	6
P.H. 12†	Hygiene and First Aid	0	..	1	..
Mil. Sci. 3†	First Year Basic Course	0	..	..	3
Also continuation of:					
In.Chem. 3	General Inorganic Chemistry, or	4	..	3	4
Hist. 17	Middle Ages, or	5	2	3	..
French 3	Continuation French	5	5	..	..

SOPHOMORE YEAR

Fall Quarter

M.&M. 91	Calculus for Architects	4	4	..	..
Arch. 24	Freehand Drawing	2	..	..	6
Arch. 31	Architectural Design I	3	..	2	6
Phys. 3‡	Elements of Mechanics	3	1	3	..
Draw. 61	Projections	2	..	1	3
Mil. Sci. 4†	Second Year Basic Course	0	..	..	3
Electives*					

Winter Quarter

M.&M. 92	Mechanics for Architects	4	4	..	..
Arch. 25	Freehand Drawing	2	..	..	6
Arch. 32	Architectural Design I	3	..	2	6
Phys. 23‡	Heat	3	1	3	..
Draw. 62	Shades and Shadows	2	..	1	3
Mil. Sci. 5†	Second Year Basic Course	0	..	..	3
Electives*					

Spring Quarter

M.&M. 93	Strength of Materials for Architecture.....	4	4	..	..
Arch. 26	Freehand Drawing	2	..	..	6
Arch. 33	Architectural Design I	3	..	2	6
Phys. 43‡	Electricity	3	1	3	..
Draw. 63	Perspective	2	..	1	3
Mil. Sci. 6†	Second Year Basic Course	0	..	..	3
Electives*					

JUNIOR YEAR

Fall Quarter

Arch. 14	Architectural History	2	..	2	..
Arch. 34	Architectural Design II	4	..	..	12
Arch. 41	Building Construction	3	1	2	..
C.E. 38	Structural Design	3	..	3	..
Electives*					

* See pages 37 and 62.

† Women take Phys.Ed. for Women, Phys.Ed. 1, 2, 3 in place of Mil.Sci. 1, 2, 3 and

P.H. 12.

‡ Students who present one unit of high school physics may omit physics.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Winter Quarter</i>					
Arch. 15	Architectural History	2	..	2	..
Arch. 35	Architectural Design II	4	..	..	12
Arch. 42	Building Construction	3	1	2	..
C.E. 39	Structural Design	3	..	3	..
	Electives*				
<i>Spring Quarter</i>					
Arch. 16	Architectural History	2	..	2	..
Arch. 36	Architectural Design II	4	..	..	12
Arch. 43	Building Construction	3	1	2	..
C.E. 41	Structural Design	3	..	3	..
	Electives*				
FOURTH YEAR					
<i>Fall Quarter</i>					
Arch. 17	Architectural History	2	..	2	..
Arch. 37	Architectural Design III	6	..	..	18
Arch. 43	Building Construction	2	..	2	..
E.E. 40	Electrical Equipment	2	..	2	..
	Electives*				
<i>Winter Quarter</i>					
Arch. 18	Architectural History	2	..	2	..
Arch. 38	Architectural Design III	6	..	..	18
Arch. 142	Building Construction	2	..	2	..
C.E. 171	Building Sanitation	2	..	2	..
	Electives*				
<i>Spring Quarter</i>					
Arch. 19	Architectural History	2	..	2	..
Arch. 39	Architectural Design III	6	..	..	18
Arch. 143	Building Construction	2	..	2	..
M.E. 164	Heating and Ventilation	2	..	2	..
	Electives*				
SENIOR YEAR					
<i>Fall Quarter</i>					
Arch. 131 or Arch. 144	Architectural Design IV	8	..	..	24
	Construction Design	6	..	..	18
	Electives*				
<i>Winter Quarter</i>					
Arch. 132 or Arch. 145	Architectural Design IV	8	..	..	24
	Construction Design	6	..	..	18
	Electives*				

* See pages 37 and 62.

ARCHITECTURE

37

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
Arch. 133	Architectural Design IV	8	..	..	24
or					
Arch. 146	Construction Design	6	..	..	18
Arch. 140	Thesis	8			
Arch. 153	Business Relations	2	..	2	..

ARCHITECTURAL ELECTIVES

Course No.	Title	Credits
Arch. 27f,w,s-28f,w,s-29f,w,s	Freehand Drawing, per quarter.....	2
Arch. 84f,w,s-85f,w,s-86f,w,s	Modeling, per quarter	2
Arch. 121f,w,s-122f,w,s-123f,w,s	Life Drawing, per quarter.....	1
Arch. 134f,w,s-135f,w,s-136f,w,s	Interior Design, per quarter.....	7
Arch. 151f	Architectural Seminar	1
Arch. 152w	Estimating	1
Arch. 154w	Acoustics of Buildings	1
Arch. 161f	Decoration and Applied Arts.....	2
Arch. 162w	Landscape Design	2
Arch. 163s	History of Painting and Sculpture.....	2

For those who desire to specialize in Building Construction, various elective courses in the fields of civil, electrical, and mechanical engineering are available. These students should elect both chemistry and physics.

For a general list of elective courses in other colleges, see page 62 of this bulletin. Others will be found in the bulletin of the College of Science, Literature, and the Arts.

FOUR-YEAR COURSE

Four-year course leading to the degree of bachelor of architecture, B.Arch., for students who entered prior to 1932. (Replaced by the 5-year course beginning in the fall of 1932.)

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits. Also, 1,008 design points must be earned (see note, page 71).

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 91‡	Calculus for Architects	4	4	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Arch. 14	Architectural History	2	..	2	..
Arch. 24	Freehand Drawing	2	..	..	6
Arch. 34	Architectural Design, Grade I	4	..	..	12
Arch. 44	Building Construction	2	1	2	..
Mil. Sci. 4†	Second Year Basic Course	0	..	..	3

Winter Quarter

M.&M.92‡	Mechanics for Architects	4	4	..	..
Phys. 23	Heat	3	1	3	..
Arch. 15	Architectural History	2	..	2	..
Arch. 25	Freehand Drawing	2	..	..	6
Arch. 35	Architectural Design, Grade I	4	..	..	12
Arch. 45	Building Construction	2	1	2	..
Mil. Sci. 5†	Second Year Basic Course	0	..	..	3

† Women take Phys.Ed. for Women in place of Mil. Sci. 4, 5, 6.

‡ For permissible substitutes, see page 61.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.&M. 98‡	Strength of Materials for Architects	4	4	..	..
Phys. 43	Electricity	3	1	3	..
Arch. 16	Architectural History	2	..	2	..
Arch. 26	Freehand Drawing	2	..	..	6
Arch. 36	Architectural Design, Grade I	4	..	..	12
Arch. 46	Building Construction	2	1	2	..
Mil. Sci. 6†	Second Year Basic Course	0	..	..	3
JUNIOR YEAR					
<i>Fall Quarter</i>					
Arch. 17	Architectural History	2	..	2	..
Arch. 27	Freehand Drawing	2	..	..	6
Arch. 37	Architectural Design, Grade II	7	..	..	21
C.E. 38	Stresses in Structures	3	..	3	..
	Electives*				
<i>Winter Quarter</i>					
Arch. 18	Architectural History	2	..	2	..
Arch. 28	Freehand Drawing	2	..	..	6
Arch. 38	Architectural Design, Grade II	7	..	..	21
C.E. 39	Structural Design	3	..	3	..
	Electives*				
<i>Spring Quarter</i>					
Arch. 19	Architectural History	2	..	2	..
Arch. 29	Freehand Drawing	2	..	..	6
Arch. 39	Architectural Design, Grade II	7	..	..	21
C.E. 41	Reinforced Concrete	3	..	3	..
	Electives*				
SENIOR YEAR					
<i>Fall Quarter</i>					
Arch. 131	Architectural Design, Grade III	10	..	..	30
Arch. 141	Building Construction	2	..	2	..
Arch. 151	Architectural Seminar	1	..	1	..
Arch. 161	Decoration and Applied Arts	2	..	2	..
E.E. 40	Electric Wiring and Equipment	2	..	2	..
<i>Winter Quarter</i>					
Arch. 132	Architectural Design, Grade III	10	..	..	30
Arch. 142	Building Construction	2	..	2	..
Arch. 152	Estimating	1	..	1	..
Arch. 162	Landscape Design	2	..	2	..
C.E. 171	Building Sanitation	2	..	2	..
<i>Spring Quarter</i>					
Arch. 133	Architectural Design, Grade III	9	..	..	27
Arch. 143	Building Construction	2	..	2	..
Arch. 153	Business Relations	2	..	2	..
Arch. 163	History of Painting and Sculpture	2	..	2	..
M.E. 164	Heating and Ventilating	2	..	2	..

* For list of suggested electives see page 62.

† Women take Phys.Ed. for Women in place of Mil.Sci. 4, 5, 6.

‡ For permissible substitutes, see pages 61.

ARCHITECTURAL ENGINEERING

Four-year course leading to the degree of bachelor of architectural engineering, B.Arch.E., for students who entered prior to 1932. (To be discontinued when present students graduate, in 1935.)

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation. This is an average of 17 credits per quarter.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 24	Differential Calculus	5	5	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2
Arch. 14	Architectural History	2	..	2	..
Arch. 34	Architectural Design, Grade I	4	..	..	12
Arch. 44	Building Construction	2	1	2	..
Mil. Sci. 4	Second Year Basic Course	0	..	..	3
<i>Winter Quarter</i>					
M.&M. 25	Integral Calculus	5	5	..	..
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
Arch. 15	Architectural History	2	..	2	..
Arch. 35	Architectural Design, Grade I	4	..	..	12
Arch. 45	Building Construction	2	1	2	..
Mil. Sci. 5	Second Year Basic Course	0	..	..	3
<i>Spring Quarter</i>					
M.&M. 26	Technical Mechanics (Statics)	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
Arch. 16	Architectural History	2	..	2	..
Arch. 36	Architectural Design, Grade I	4	..	..	12
Arch. 46	Building Construction	2	1	2	..
Mil. Sci. 6	Second Year Basic Course	0	..	..	3

JUNIOR YEAR

<i>Fall Quarter</i>					
M.&M. 128	Strength of Materials	5	5	..	..
M.&M. 141	Materials Testing Laboratory	2	1	..	3
C.E. 31	Stresses in Structures	2	..	1	2
Arch. 17	Architectural History	2	..	2	..
Arch. 47	Building Construction	2	..	..	6
Chem. 1	Inorganic Chemistry	4	..	3	4
<i>Winter Quarter</i>					
M.&M. 127	Technical Mechanics (Dynamics)	5	5	..	..
C.E. 35	Analysis of Buildings	3	..	1	4
Arch. 18	Architectural History	2	..	2	..
Arch. 48	Building Construction	2	..	..	6
Chem. 2	Inorganic Chemistry	4	..	3	4

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.&M. 129	Hydraulics	4	3	1	..
M.&M. 143	Hydraulics Laboratory	1	..	..	2
C.E. 36	Design of Steel Frame Buildings	4	..	1	6
Arch. 19	History of Architecture	2	..	2	..
Arch. 49	Building Construction	3	..	..	9
Chem. 3	Inorganic Chemistry	4	..	3	4

SENIOR YEAR

Fall Quarter

Arch. 141	Building Construction	2	..	2	..
M.E. 163	Heating and Ventilating	4	2	1	4
C.E. 141a	Reinforced Concrete	3	1	..	2
E.E. 40	Electric Wiring and Equipment	2	..	2	..
	Electives*				

Winter Quarter

Arch. 142	Building Construction	2	..	2	..
Arch. 152	Estimating	1	..	1	..
C.E. 142a	Reinforced Concrete	3	1	..	2
C.E. 171	Building Sanitation	2	..	2	..
E.E. 49	Electric Motors	2	2	..	..
	Electives*				

Spring Quarter

Arch. 153	Business Relations	2	..	2	..
C.E. 18	Surveying	3	..	..	8
C.E. 135	Reinforced Concrete Design	4	..	2	6
M.E. 140	Heat Engines	4	3	..	4
Arch. 143	Building Construction	2	..	2	..
	Electives*				

CHEMISTRY AND CHEMICAL ENGINEERING

FRESHMAN AND SOPHOMORE YEARS

The freshman year and the first two quarters of the sophomore year are the same in Chemistry as in Chemical Engineering, so that the student may change from one course to the other prior to the spring quarter.

REGULAR FRESHMAN YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 11	College Algebra	5	5	..	..
Inorg.Chem. 9	General Inorganic Chemistry	5	1	3	5
English. 4	Rhetoric and Composition	3	3	..	..
Drawing 4‡	Drawing and Descriptive Geometry	2	..	..	6
M.E. 12, 13, or 17‡	Shop	2	..	1	4
Mil. Sci. 1†	First Year Basic Course	0	..	..	3

* Program is arranged to accommodate Econ. 8f-9w, 28s; Engl. 7w; Geol. 5f.

† Women take Phys.Ed. for Women, courses Phys.Ed. 1, 2, 3, in place of Mil.Sci. 1, 2, 3 and P.H. 12.

‡ For permissible substitutes, see page 61.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Winter Quarter</i>					
M.&M. 12	Trigonometry	5	5	..	..
Inorg.Chem. 10	General Inorganic Chemistry	5	1	3	5
English 5	Rhetoric and Composition	3	3	..	..
Drawing 5‡	Drawing and Descriptive Geometry	2	..	..	6
M.E. 12, 13, or 17‡	Shop	2	..	1	4
Mil. Sci. 2†	First Year Basic Course	0	..	..	3

Spring Quarter

M.&M. 13	Analytic Geometry	5	5	..	..
Inorg.Chem. 12	Qualitative Analysis	5	2	1	6
English 6	Rhetoric and Composition	3	3	..	..
Drawing 6‡	Drawing and Descriptive Geometry	2	..	..	6
M.E. 12, 13, or 17‡	Shop	2	..	1	4
P.H. 12†	Hygiene and First Aid	0	..	1	..
Mil. Sci. 3†	First Year Basic Course	0	..	..	3

REGULAR SOPHOMORE YEAR

Fall Quarter

M.&M. 24	Differential Calculus	5	5	..	..
Inorg.Chem. 13	Qualitative Analysis	5	2	..	9
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2
German 24	Chemical German	4	4	..	..
Mil. Sci. 4†	Second Year Basic Course .....	..	..	..	3

Winter Quarter

M.&M. 25	Integral Calculus	5	5	..	..
Anal.Chem. 1	Quantitative Analysis	5	1	1	10
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
German 25	Chemical German	4	4	..	..
Mil. Sci. 5†	Second Year Basic Course .....	..	..	..	3

Spring Quarter (Chemistry)

M.&M. 84‡	Technical Mechanics	5	5	..	..
Anal.Chem. 2	Quantitative Analysis	5	1	1	10
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
German 26	Chemical German	4	4	..	..
Mil. Sci. 6†	Second Year Basic Course .....	..	..	..	3

Spring Quarter (Chemical Engineering)

M.&M. 84‡	Technical Mechanics	5	5	..	..
Anal.Chem. 2	Quantitative Analysis	5	1	1	10
Chem.E. 80	Technical Engineering Materials	1	..	2	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
German 26	Chemical German	4	4	..	..
Mil. Sci. 6†	Second Year Basic Course	0	..	..	3

† Women take Phys. Ed. for Women, courses Phys.Ed. 1, 2, 3 in place of Mil. Sci. 1, 2, 3 and P.H. 12; also Phys.Ed. for Mil.Sci. 4, 5, 6.

‡ For permissible substitutes, see page 61.

CHEMISTRY

Four-year course leading to the degree of bachelor of chemistry, B.Chem.

In addition to the prescribed courses, sufficient approved electives must be taken to complete a total of at least 210 credits.

This professional course in Chemistry is designed to provide thoro training in the fundamentals of chemistry and related subjects. It serves as a basis for further specialization and a foundation for graduate work. Its graduates secure positions in practical chemistry, research, and teaching, in chemical industries, the government service, in colleges and laboratories, etc.

For freshman year see page 40.

JUNIOR YEAR				Credits	Rec.	Lect.	Lab.
Course No.	Title						
<i>Fall Quarter</i>							
Org.Chem. 51	Organic Chemistry	.....	5	2	3	4	
Phys.Chem. 101	Physical Chemistry	.....	5	1	3	6	
Phys. 33	Optics	.....	3	1	3	..	
Phys. 34	Optics Laboratory	.....	1	..	..	2	
	Electives*						
<i>Winter Quarter</i>							
Org.Chem. 52	Organic Chemistry	.....	5	2	3	4	
Phys.Chem. 102	Physical Chemistry	.....	5	1	3	6	
Chem.E. 131	Industrial Inorganic Chemistry	.....	4	1	4	..	
	Electives*						
<i>Spring Quarter</i>							
Org.Chem. 53	Organic Chemistry	.....	5	2	3	4	
Phys.Chem. 103	Physical Chemistry	.....	5	1	3	6	
Chem.E. 132	Industrial Organic Chemistry	.....	4	1	4	..	
Inorg.Chem. 51	Junior Review Exam. (General Inorg.)	.....	0	2	..	..
Inorg.Chem. 52	Junior Review Exam. (Qualitative)	.....	0	1	..	..
Inorg.Chem. 53	Junior Review Exam. (Quantitative)	.....	0	2	..	..
	Electives*						
SENIOR YEAR (See note, page 43.)							
<i>Fall Quarter</i>							
Inorg.Chem. 103	Advanced Inorganic Chemistry	.....	3	..	3	..	
Anal.Chem. 131	Applications of Indicators	.....	3	..	2	5	
Phys.Chem. 161	Radioactivity	.....	2	..	2	..	
	Electives*						
<i>Winter Quarter</i>							
Inorg.Chem. 104	Advanced Inorganic Chemistry	.....	3	..	3	..	
Anal. Chem. 132	Electrometric Measurements and Titrations	..	3	..	2	5	
Phys.Chem. 162	Radioactivity	.....	2	..	2	..	
	Electives*						
<i>Spring Quarter</i>							
Inorg.Chem. 105	Advanced Inorganic Chemistry	.....	3	..	3	..	
Chem.Eng. 110	Special Analytical Apparatus	.....	3	..	1	6	
	Electives*						

* For list of suggested electives in other colleges see page 62.

NOTE.—Near the close of the junior year, each student will choose a major adviser from the following list. In consultation with the adviser he will plan a program of work for the entire senior year, based normally upon concentration of electives around a chosen field of chemistry.

LIST OF ADVISERS FOR SENIORS

Inorganic Chemistry: Professors Sneed, Cohen, Stephens, Pervier, Barber.
 Analytical Chemistry: Professors Kolthoff, Geiger, Sarver.
 Organic Chemistry: Professors Smith, Lauer.
 Physical Chemistry: Professors Lind, MacDougall, Reyerson, Glockler, Taylor, Livingston.
 Chemical Engineering: Professors Mann, Montillon, Montonna, Stoppel.

SPECIALIZATION IN BACTERIOLOGY, BIOCHEMISTRY, AND GEOLOGY

For the benefit of students in chemistry who may desire to specialize in related fields, minor groups of electives have been arranged in bacteriology, biochemistry, and geology which may be taken in the junior and senior years in addition to the required courses of the regular chemistry curriculum shown above. The completion of one of these groups will qualify the chemistry graduate to enter upon graduate work towards the Doctor's degree, in that department thus providing an exceptionally strong foundation in chemistry for specialization in the chosen field.

MINOR IN BACTERIOLOGY

Course No.	Title	JUNIOR YEAR			
		Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
Zool. 14	General Zoology	3	..	2	4
<i>Winter Quarter</i>					
Zool. 15	General Zoology	3	..	2	4
<i>Spring Quarter</i>					
Zool. 16	General Zoology	3	..	2	4
SENIOR YEAR					
<i>Fall Quarter</i>					
Bact. 41	General Bacteriology	5	..	3	6
<i>Winter Quarter</i>					
Bact. 121	Industrial Bacteriology	3	..	3	..
<i>Spring Quarter</i>					
Bact. 122	Industrial Bacteriology	3	..	3	..

MINOR IN BIOCHEMISTRY

JUNIOR YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
Zool. 14†	General Zoology	3	..	2	4
<i>Winter Quarter</i>					
Zool. 15†	General Zoology	3	..	2	4
<i>Spring Quarter</i>					
Zool. 16†	General Zoology	3	..	2	4

SENIOR YEAR

Fall Quarter

Ag.Biochem. 113	Biochemical Laboratory Methods	2	..	..	6
Ag.Biochem. 119	Colloids	3	..	3	..
Bact. 41	General Bacteriology	5	..	3	..

Winter Quarter

Ag.Biochem. 114	Biochemical Laboratory Methods	2	6
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Spring Quarter

Ag.Biochem. 115	Biochemical Laboratory Methods	2	6
Ag.Biochem. 123	Enzymes	3	..	3	..

MINOR IN GEOLOGY

JUNIOR YEAR

Winter Quarter

Min. 23	Elements of Mineralogy	4	1	2	4
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Spring Quarter

Min. 24	Elements of Mineralogy	4	1	2	4
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SENIOR YEAR

Fall Quarter

Geol. 1	General Geology	3	1	3	..
Geol. A	General Geology Laboratory	2	4
Geol. 121	Crystallography	3	..	3	2

Winter Quarter

Geol. 3	General Geology (Dynamic and Economic)..	3	1	3	..
Geol. C	General Geology Laboratory	2	..	..	4

† Nine credits of Botany may be substituted for Zoology 14-15-16.

CHEMICAL ENGINEERING

Four-year course leading to the degree of bachelor of chemical engineering, B.Ch.E.

In addition to the prescribed courses, sufficient approved electives must be taken to complete a total of 218 credits.

The additional eight credits above the course in Chemistry are made up of two credits for the inspection trip in the spring vacation of the senior year and six credits for the two courses in Chemical Manufacture in the Summer Session following the junior year. Thus the term requirements of the two courses are equal in amount and average $17\frac{1}{2}$ credits per quarter for 12 quarters.

Chemical engineering deals with the unit operations, such as crushing, grinding, sifting, mixing, filtration, evaporation, drying, distillation, and crystallization that are so vital in making any industry based on a chemical transformation of matter a commercial success. The chemist uses these operations in the laboratory but in order to apply them to large scale industrial processes he must have a thorough understanding of the fundamental physico-chemical and engineering principles on which they are based. The study of such principles constitutes the applied science of chemical engineering. For this purpose the chemical engineer must be thoroughly trained in the various branches of chemistry, physics, and mathematics and he must have a good training in the fundamentals of mechanical and electrical engineering so that he can design, construct, and successfully operate a plant using these unit operations.

The chemical engineer is primarily a producer. It is his province to develop a process from the laboratory stage through semi-works equipment to the production stage which uses engineering materials for the manufacture of unit process equipment in accordance with fundamental chemical engineering principles.

As many industries are based on some chemical operation, the chemical engineer is much in demand. He may be engaged in the manufacture of inorganic products—the mineral acids, alkalis, ammonia, paint pigments, fertilizers; in the organic industries—dyes, explosives, lacquers, solvents, medicinals; in the manufacture of gases—coal gas, carbureted blue gas, hydrogen, acetylene, helium; in the electro-chemical industries such as the manufacture of graphite, calcium carbide, carborundum and other abrasives, wet and dry batteries, electroplating; in the metallurgical industries; and even in the food industries such as the manufacture of sugar, flour, salt, and starch. There are many others as leather, paper, textiles, soaps, petroleum, glass, and cement.

In these industries the chemical engineer does investigational work, development work, design of equipment, and plant operation. Some enter the field of sales engineering and technical writing.

For freshman and sophomore years see pages 40 and 41.

		JUNIOR YEAR		
Course No.	Title	Credits	Rec.	Lect. Lab.
		<i>Fail Quarter</i>		
Chem. E. 101	Unit Processes	3	..	5 ..
Chem. E. 105	Methods of Technical Analysis	3	1	1 4
Org. Chem. 51	Organic Chemistry	5	2	3 4
M.&M. 85‡	Strength of Materials (with lab.)	4	3	.. 2
Physics 33	Optics	3	1	3 ..

‡ For permissible substitutes, see page 61.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Winter Quarter</i>					
Chem. E. 106	Methods of Technical Analysis	3	1	1	4
Chem. E. 131	Industrial Inorganic Chemistry	4	1	4	..
Org. Chem. 52	Organic Chemistry	5	2	3	4
M.&M. 86‡	Hydraulics	2	2	..	..
M.&M. 143	Hydraulics Laboratory	1	..	..	2
M.E. 38	Heat Engines	3	..	3	..
<i>Spring Quarter</i>					
Chem. E. 102	Unit Processes	3	3	..	..
Chem. E. 132	Industrial Organic Chemistry	4	1	4	..
Chem. E. 150	Unit Process Laboratory	1	..	..	3
Org. Chem. 53	Organic Chemistry	5	2	3	4
M.E. 28	Machine Design	3	..	1	6
M.E. 39	Heat Engines	3	..	2	4
Inorg. Chem. 51	Junior Review Exam. (General Inorg.)	0	2	..	..
Inorg. Chem. 52	Junior Review Exam. (Qualitative)	0	1	..	..
Anal. Chem. 53	Junior Review Exam. (Quantitative)	0	2	..	..

SUMMER SESSION

Summer practice consisting of Chem. E. 151f,su-152w,su, Chemical Manufacture, will be taken by students in Chemical Engineering in the regular Summer Session between their junior and senior years. It is required for the degree of bachelor of chemical engineering.

SENIOR YEAR

Fall Quarter

Chem. E. 103	Unit Process Problems	3	3	..	..
Phys. Chem. 101	Physical Chemistry	5	1	..	..
E.E. 43	Electric Power	3	..	3	2
Met. 160	Metallography	3	..	2	3
	Electives*				

Winter Quarter

Chem. E. 104	Unit Process Problems	3	3	..	..
Chem. E. 121	Chemical Engineering Economics	3	1	2	..
Phys. Chem. 102	Physical Chemistry	5	1	3	6
E.E. 44	Electric Power	3	..	3	2
	Electives*				

Spring Quarter

Chem. E. 187	Inspection Trip, spring vacation	2	..	..	..
Chem. E. 117	Chemical Engineering Equipment Design	3	..	..	6
Phys. Chem. 103	Physical Chemistry	5	1	3	6
E.E. 45	Electric Power	3	..	3	2
	Electives*				

CIVIL ENGINEERING

Four-year course leading to the degree of bachelor of civil engineering, B.C.E.

In addition to the prescribed courses, sufficient electives must be taken to com-

* For list of electives in other colleges see page 62.

‡ For permissible substitutes, see page 61.

plete a total of at least 204 credits for graduation. This is an average of 17 credits per quarter.

The principal aim of the course in civil engineering is to present to the student an opportunity to become familiar with the methods of science, so that in his attack upon any professional problem he may employ his abilities with economy and secure dependable conclusions. A secondary but important object of the course is to train the student in technique, so that at graduation he may be able to be an economic asset to his employer.

The technique of surveying and platting, drawing, and certain laboratory procedures is taught throughout the course. Typical problems of railroad, highway, hydraulic, structural, and municipal engineering occupy the greater part of the last two years. In the junior year, there is a course of lectures and conferences on the relations of engineering projects to business and to public affairs. Elective courses are available in each of the three upper years; these offer a wide range of choice to the student who desires to extend his range of interests to those fields of knowledge and action related to civil engineering, but not strictly included therein.

The field of civil engineering is so comprehensive that no attempt is made toward specialization in the regular course of four years. Special courses for graduate students are offered in all of the divisions of railroad, highway, structural, hydraulic, and municipal engineering.

For freshman year, see page 27.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 24	Differential Calculus	5	5	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2
Draw. 21	Drafting	2	..	..	6
C.E. 11	Surveying	3	1	..	7
Mil. Sci. 4	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Winter Quarter</i>					
M.&M. 25	Integral Calculus	5	5	..	..
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
Draw. 22	Drafting	2	..	..	6
C.E. 12	Surveying	3	1	..	7
Mil. Sci. 5	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Spring Quarter</i>					
M.&M. 26	Technical Mechanics (Statics)	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
Draw. 23	Drafting	2	..	..	6
C.E. 13	Surveying	3	1	..	7
Mil. Sci. 6	Second Year Basic Course	0	..	..	3
	Electives*				

* For list of elective courses in other colleges see page 62.

JUNIOR YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 128	Strength of Materials	5	5	..	..
M.&M. 141	Materials Laboratory	2	..	1	3
C.E. 14	Surveying	3	..	..	8
C.E. 31	Stresses in Structures	2	..	1	2
C.E. 51	Highways and Pavements	3	..	2	3
	Electives*				
<i>Winter Quarter</i>					
M.&M. 129	Hydraulics	4	3	1	..
M.&M. 143	Hydraulics Laboratory	1	..	..	2
C.E. 15	Surveying	2	..	4	..
C.E. 21	Railway Engineering	2	1	..	4
C.E. 32	Stresses in Structures	3	..	1	4
C.E. 52	Highways and Pavements	3	..	1	6
	Electives*				
<i>Spring Quarter</i>					
M.&M. 127	Technical Mechanics (Dynamics)	5	5	..	..
C.E. 16	Surveying	2	..	4	..
C.E. 22	Railway Engineering	2	1	..	4
C.E. 33	Elementary Structural Design	4	..	1	4
C.E. 53	Civil Engineering Practice	3	1	2	..
	Electives*				
<i>Summer Camp</i>					
C.E. 23	Summer camp is held in the vacation preceding the senior year for 6 weeks beginning about the middle of August. Nine credits. Required of all students taking the course in Civil Engineering. Fee, \$25.				

SENIOR YEAR

<i>Fall Quarter</i>					
C.E. 121	Railway Engineering	3	..	1	6
C.E. 134	Statically Indeterminate Structures	3	2	..	2
C.E. 141	Reinforced Concrete	3	1	..	2
C.E. 161	Hydrology	3	1	1	3
C.E. 146	Plain Concrete	3	..	2	4
or					
C.E. 164	Water Power	3	..	1	6
	Electives*				
<i>Winter Quarter</i>					
C.E. 124	Transportation	3	3	..	..
C.E. 131	Bridge Analysis	3	1	..	2
C.E. 142	Reinforced Concrete Design	3	1	..	2
C.E. 162	Water Supply and Sewerage	3	..	2	4
E.E. 42	Electric Power	4	3	..	2
or					
M.E. 140	Heat Engines	4	3	..	4
	Electives*				

* For list of elective courses in other colleges see page 62.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
C.E. 132	Bridge Design	3	..	1	6
C.E. 163	Water Supply and Sewerage	3	..	2	5
C.E. 146	Plain Concrete	3	..	2	4
or					
C.E. 164	Water Power	3	..	1	6
E.E. 42	Electric Power	4	3	..	2
or					
M.E. 140	Heat Engines	4	3	..	4
	Electives*				

SPECIAL SENIOR YEAR

(For students who have completed Courses C.E. 23, 131, 132, 134,† Such students may be able to graduate at the end of the winter quarter if they have sufficient electives and no deficiencies.)

<i>Fall Quarter</i>					
C.E. 121	Railway Engineering	3	..	1	6
C.E. 141	Reinforced Concrete Design	3	1	..	2
C.E. 161	Hydrology	3	1	1	3
C.E. 162	Water Supply and Sewerage	3	..	1	6
M.E. 140	Heat Engines	4	3	..	4
	Electives*				

<i>Winter Quarter</i>					
C.E. 124	Transportation	3	3	..	..
C.E. 142	Reinforced Concrete Design	3	1	..	2
C.E. 146	Plain Concrete	3	..	1	4
C.E. 163	Water Supply and Sewerage	3	..	2	5
C.E. 164	Water Power	3	..	1	6
E.E. 42	Electric Power	4	3	..	2
	Electives*				

ELECTRICAL ENGINEERING

Four-year course leading to the degree of bachelor of electrical engineering, B.E.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation.

The course in Electrical Engineering is designed to fit the student for a position of responsibility in the electrical field. This work is based upon the principles of electricity and magnetism contained in the prescribed courses in general physics and upon the principles of mathematics. In the senior year, specialized courses may be selected in the field of electric power generation, transmission, and utilization, in telephone and radio communication or in illumination.

The main laboratory of the department is well equipped for preliminary training in the operation of electrical machinery and for advanced research prob-

* For list of elective courses in other colleges see page 62.

† Courses C.E. 131, 132, and 134 have been offered in the summer quarter by special arrangement only.

lems in this field. The communication laboratories contain, besides the general equipment for study of circuits and equipment, a complete commercial radio broadcasting station and an experimental high frequency, short wave station.

Graduate courses in this department, together with graduate courses in physics and mathematics, are available for those with exceptional ability who desire training beyond the usual four-year undergraduate curriculum.

For freshman year, see page 27.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 24	Differential Calculus	5	5	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2
M.E. 16	Forge Practice	2	..	1	4
E.E. 11	Elements of Electrical Engineering.....	3	2	1	..
Mil. Sci. 4	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Winter Quarter</i>					
M.&M. 25	Integral Calculus	5	5	..	..
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
Draw. 26†	Drafting	2	..	..	6
E.E. 13	Elements of Electrical Engineering	3	2	1	2
Mil. Sci. 5	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Spring Quarter</i>					
M.&M. 26	Technical Mechanics (Statics)	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
E.E. 15	Elements of Electrical Engineering	3	2	1	2
M.E. 19	Machine Shop Practice	2	..	1	4
Mil. Sci. 6	Second Year Basic Course	0	..	..	3
	Electives*				

JUNIOR YEAR ‡

<i>Fall Quarter</i>					
M.&M. 129	Hydraulics	4	3	1	..
M.&M. 143	Hydraulics Laboratory	1	..	..	2
E.E. 111	Electrical Engineering	5	5	..	..
E.E. 112	Electrical Engineering Laboratory	2	..	..	4
Phys. 144	Electrical Measurements	3	1	1	4
	Electives*				
<i>Winter Quarter</i>					
M.&M. 127	Technical Mechanics (Dynamics)	5	5	..	..
E.E. 113	Electrical Engineering	5	5	..	..
E.E. 114	Electrical Engineering Laboratory	2	..	..	4
M.E. 26	Mechanism and Kinematics	3	3	..	..
	Electives*				

* For list of elective courses in other colleges see page 62.

† For permissible substitutes, see page 61.

‡ Students expecting to elect the communication option in the senior year must take E.E. 64-65-66 Elements of Communication in the junior year.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.&M. 128	Strength of Materials	5	5	..	..
M.&M. 141	Materials Laboratory	2	..	1	3
E.E. 115	Electrical Engineering	5	5	..	..
E.E. 116	Electrical Engineering Laboratory	2	..	..	4
	Electives*				
SENIOR YEAR					
POWER OPTION					
<i>Fall Quarter</i>					
E.E. 121	Electrical Engineering	3	3	..	..
E.E. 122	Electrical Engineering Laboratory	2	..	..	4
E.E. 132	Electrical Design †	2	2	..	..
M.E. 138	Heat Engines †	3	2	..	3
	Electives*				
<i>Winter Quarter</i>					
E.E. 123	Electrical Engineering	3	3	..	..
E.E. 124	Electrical Engineering Laboratory	2	..	..	4
E.E. 134	Electrical Design †	2	2	..	..
M.E. 139	Heat Engines †	3	2	..	3
	Electives*				
<i>Spring Quarter</i>					
E.E. 125	Electrical Engineering	3	3	..	..
E.E. 126	Electrical Engineering Laboratory	2	..	..	4
E.E. 136	Electrical Design † ‡	2	2	..	..
M.E. 55	Internal Combustion Engines †	3	2	..	3
	Electives*				
COMMUNICATION OPTION §					
<i>Fall Quarter</i>					
E.E. 121	Electrical Engineering	3	3	..	..
E.E. 122	Electrical Engineering Laboratory	2	..	..	4
E.E. 161	Radio Communication	3	..	2	3
E.E. 164	Electrical Communication	3	..	2	3
	Electives*				
<i>Winter Quarter</i>					
E.E. 123	Electrical Engineering	3	3	..	..
E.E. 124	Electrical Engineering Laboratory	2	..	..	4
E.E. 162	Radio Communication	3	..	2	3
E.E. 165	Electrical Communication	3	..	2	3
	Electives*				

* For list of elective courses in other colleges see page 62.

† Students specializing in chemistry, physics, or mathematics may substitute electives in that department for courses E.E. 132, 134, 136 and M.E. 138, 139, and 55. Such specialization requires at least 18 credits of elective work in chemistry, physics, or mathematics.

‡ Students specializing in business may substitute an approved elective in that department for Course E.E. 136.

§ Students expecting to elect the communication option in the senior year must take E.E. 64-65-66 in the junior year.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
E.E. 125	Electrical Engineering	3	3	..	..
E.E. 126	Electrical Engineering Laboratory	2	..	..	4
E.E. 163	Radio Communication	3	..	2	3
E.E. 166	Electrical Communication	3	..	2	3
	Electives*				

SPECIALIZED COURSES IN ELECTRICAL ENGINEERING

The number of electives in the electrical engineering course makes it practicable to obtain either a broad or a specialized education. Further to facilitate such election, certain courses (indicated by †) in the senior year may be replaced by substitutes in physics, chemistry, or mathematics, subject to the approval of the head of the department and the Students' Work Committee. By properly choosing prerequisite subjects during the sophomore or junior year, a far-seeing student may prepare for advanced specialized courses in the following undergraduate and graduate years. As examples, one may specialize in business, chemistry, communication, illumination, manufacturing, military science, physics, power generation and distribution, public utilities, railway engineering, or other chosen line. Students are advised to consult with their classifier, or with the head of the department, concerning desirable sequences of general or special courses.

INTERIOR ARCHITECTURE

Four-year course leading to the degree of bachelor of interior architecture, B.Int.Arch.

The course in interior architecture is primarily designed to meet vocational needs of women who wish to prepare for the practice of architecture, or interior decoration. This course requires normally four years for its completion, the first two years in the College of Science, Literature, and the Arts, and the last two years in the College of Engineering and Architecture, including 195 credits.

For the freshman and sophomore years, students register in the College of Science, Literature, and the Arts and complete the requirements of the Lower Division, including the required courses, 93 credits, and 93 honor points.

COURSES REQUIRED IN THE FIRST TWO YEARS

	Credits
English A-B-C or Composition 4-5-6 or exemption from requirements (see page 25 S.L.A. bulletin)	0 to 15
Mathematics 4 or 6 (with prerequisite)	4 to 10
French (see Lower Division Requirements, page 27, S.L.A. bulletin)	0 to 20
History 11-12-13	10
Physics 3 and 4 and any one of the continuations, 23, 33, 43, with laboratory	8
or	
Chemistry 1-2-3 or 4-5 or 6-7-8 or 9-10	8 to 15
Architecture 21-22-23	6
Architecture 31-32-33	9
Drawing 61-62-63	6
Physical Education	3

* For list of elective courses in other colleges see page 62.

Students who enter without either French, higher algebra, or high school chemistry, should register in the freshman year for Freshman English (see page 25 S.L.A. bulletin), French, chemistry, and if possible, Architecture 21-22-23. Students who enter with one or more years of French should register for Freshman English, French, and mathematics to complete the requirements, and, if possible, Architecture 21-22-23.

Having satisfied the requirements of the Lower Division, the students transfer to the College of Engineering and Architecture and pursue the following curriculum, amounting to 102 credits for the remaining two years:

JUNIOR YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
Arch. 14	Architectural History	2	..	2	..
Arch. 34	Architectural Design	4	..	..	12
Arch. 51	Building Construction	2	..	2	..
Arch. 74	Freehand Drawing	3	..	..	9
	Non-technical electives	6			

Winter Quarter

Arch. 15	Architectural History	2	..	2	..
Arch. 35	Architectural Design	4	..	..	12
Arch. 52	Building Construction	2	..	2	..
Arch. 75	Freehand Drawing	3	..	..	9
	Non-technical electives	6			

Spring Quarter

Arch. 16	Architectural History	2	..	2	..
Arch. 36	Architectural Design	4	..	..	12
Arch. 53	Building Construction	2	..	2	..
Arch. 76	Freehand Drawing	3	..	..	9
	Non-technical electives	6			

SENIOR YEAR

Fall Quarter

Arch. 17	Architectural History	2	..	2	..
Arch. 27	Freehand Drawing	2	..	..	6
Arch. 134	Interior Design	7	..	..	21
Arch. 151	Seminar	1	..	1	..
Arch. 182	Furniture and Decoration	3	..	3	..
	Non-technical electives	3			

Winter Quarter

Arch. 18	Architectural History	2	..	2	..
Arch. 28	Freehand Drawing	2	..	..	6
Arch. 135	Interior Design	7	..	..	21
Arch. 183	Furniture and Decoration	3	..	3	..
	Non-technical electives	3			

Spring Quarter

Arch. 19	Architectural History	2	..	2	..
Arch. 29	Freehand Drawing	2	..	..	6
Arch. 136	Interior Design	7	..	..	21
Arch. 163	History of Sculpture and Painting	2	..	2	..
Arch. 184	Furniture and Decoration	3	..	3	..

LANDSCAPE ARCHITECTURE

Four-year course leading to the degree of bachelor of landscape architecture, B.L.A.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation. This is an average of 17 credits per quarter for 12 quarters.

The course in landscape architecture is intended to provide instruction and training for students who desire to enter this profession. It involves the same fundamental preparation as the course in architecture, and, also, special attention is given to architectural as well as landscape design.

The profession of landscape architecture is a broad one and should not be confused with the work of the landscape gardener. The landscape architect may be concerned in the design and construction involved in parks and park systems, real estate development of a high order, and on a large scale, university campuses, civic centers, municipal and state building plans, town and city planning, etc. His professional relations with architects are so intimate as to require familiarity with the architectural profession. This is given consideration in the close relationship between the course in landscape architecture and the course in architecture.

Students who desire to enter the profession of landscape architecture, and who wish to study at the University of Minnesota before transferring to another institution to complete their professional studies, can obtain the equivalent of the two years of the standard course in Landscape Architecture, by selecting certain courses in the School of Architecture, the College of Agriculture, and other departments of the University.

FRESHMAN YEAR				
Course No.	Title	Credits	Rec.	Lect. Lab.
<i>Fall Quarter</i>				
M.&M. 11	College Algebra	5	5	.. ..
Engl. 4	Rhetoric and Composition	3	3	.. ..
Arch. 21	Freehand Drawing	2	..	.. 6
Arch. 31	Elements of Architecture	3	..	2 6
Draw. 61	Projections	2	..	1 3
G.E. 11	Orientation	0	..	1 ..
Mil. Sci. 1	First Year Basic Course	0	..	.. 3
<i>Winter Quarter</i>				
M.&M. 12	Trigonometry	5	5	.. ..
Engl. 5	Rhetoric and Composition	3	3	.. ..
Arch. 22	Freehand Drawing	2	..	.. 6
Arch. 32	Elements of Architecture	3	..	2 6
Draw. 62	Shades and Shadows	2	..	1 3
G.E. 12	Orientation	0	..	1 ..
Mil. Sci. 2	First Year Basic Course	0	..	.. 3
<i>Spring Quarter</i>				
M.&M. 13	Analytical Geometry	5	5	.. ..
Engl. 6	Rhetoric and Composition	3	3	.. ..
Arch. 23	Freehand Drawing	2	..	.. 6
Arch. 33	Elements of Architecture	3	..	2 6
Draw. 63	Perspective	2	..	1 3
P.H. 12	Hygiene and First Aid	0	..	1 ..
Mil. Sci. 3	First Year Basic Course	0	..	.. 3

LANDSCAPE ARCHITECTURE

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 91‡	Calculus	4	4	..	..
Arch. 14	Architectural History	2	..	2	..
Arch. 24	Freehand Drawing	2	..	..	6
Arch. 34	Architectural Design	4	..	..	12
Bot. 1	General Botany	4	1	3	..
Mil. Sci. 4	Second Year Basic Course	0	..	..	3

Winter Quarter

M.&M. 92‡	Technical Mechanics	4	4	..	..
Arch. 15	Architectural History	2	..	2	..
Arch. 25	Freehand Drawing	2	..	..	6
Arch. 35	Architectural Design	4	..	..	12
Bot. 21	Elementary Ecology	3	..	..	6
Mil. Sci. 5	Second Year Basic Course	0	..	..	3

Spring Quarter

M.&M. 93‡	Strength of Materials	4	4	..	..
Arch. 16	Architectural History	2	..	2	..
Arch. 26	Freehand Drawing	2	..	..	6
Arch. 36	Architectural Design	4	..	..	12
Bot. 7	Taxonomy of Flowering Plants	3	..	1	5
Mil. Sci. 6	Second Year Basic Course	0	..	..	3

Summer Session between Sophomore and Junior Years

Arch. 20	Outdoor Sketching	1			
Geol. 1	General Geology	5			
Hort. 70†	Plant Materials	3			

JUNIOR YEAR

Fall Quarter

Arch. 27	Freehand Drawing	2	..	..	6
Arch. 84	Modeling	2	..	..	6
C.E. 11	Surveying	3	1	..	7
Econ. 8	General Economics	3	3	..	..
Hort. 71	Elementary Design and Plant Material	3	..	1	4
Ph s. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2

Winter Quarter

Arch. 28	Freehand Drawing	2	..	..	6
Arch. 85	Modeling	2	..	..	6
C.E. 12	Surveying	3	1	..	7
Econ. 9	General Economics	3	3	..	..
Hort. 74	Principles of Landscape Design	3	..	1	4
Ph s. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2

† Given by special arrangement.

‡ For permissible substitutes see page 61.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
Arch. 29	Freehand Drawing	2	..	..	6
Arch. 86	Modeling	2	..	..	6
C.E. 13	Surveying	3	1	..	7
Econ. 28	Business Law	3	3	..	..
Hort. 72	Woody Plants and Garden Flowers	2	..	1	2
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2

SENIOR YEAR

Fall Quarter

Arch. 160	History of Landscape Architecture	2	..	2	..
C.E. 14	Surveying	3	..	..	8
C.E. 51	Highways and Pavements	3	2	..	3
For. 1	General Forestry	3	..	3	..
	Electives*				

Winter Quarter

G.E. 81	Estimating	3	3	..	..
Hort. 75	Landscape Problems	3	..	1	4
Phys. 33	Optics	3	1	3	..
Phys. 34	Optics Laboratory	1	..	..	2
Sp. 35	Public Speaking	3	3	..	..
	Electives*				

Spring Quarter

Ag.E. 31	Principles of Drainage	3	1	2	..
C.E. 172	City Planning	3	..	3	..
Engr. 31	Technical Writing	3	3	..	..
Hort. 76	Landscape Construction	3	..	1	4
	Electives*				

RECOMMENDED ELECTIVES

Arch. 44f,45w,46s	Building Construction	2
Hort. 56s	Plant Propagation	3

MECHANICAL ENGINEERING

Four-year course leading to the degree of bache'or of mechanical engineering, B.M.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation. This is an average of 17 credits per quarter.

It is recommended that each student in Mechanical Engineering spend at least one summer vacation in machine shop practice.

At the beginning of the junior year, the student should confer with his classifier with regard to the particular line of work, if any, for which he desires to prepare. He can then select his electives according to this plan.

The field of mechanical engineering is so broad that the young graduates enter almost every kind of industry, both in technical and executive positions.

* See pages 37 and 62.

The profession includes the following divisions: design of machinery and apparatus for all purposes; production and manufacturing methods; inspection and testing of materials and apparatus; operation of industrial plants; sales engineering; research and development; management of industry.

The course is planned to give broad training rather than highly specialized work. Fundamental courses in mathematics, physics, chemistry, and English are followed by strong courses in steam and gas machinery, electricity, hydraulics, machine design, materials testing, and mechanical laboratory work. Courses in economics, industrial management, and finance may be elected if desired.

The young man graduating in mechanical engineering will find an ever widening field of service in the future both in technical work and in administrative positions, and there is no limit to future progress except the ability of the individual.

For freshman year, see page 27.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 24	Differential Calculus	5	5	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2
M.E. 15	Foundry Practice	2	..	1	4
M.E. 20	Elementary Machine Design	2	..	..	6
M.E. 70	Mechanical Technology	1	..	2	..
Mil. Sci. 4	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Winter Quarter</i>					
M.&M. 25	Integral Calculus	5	5	..	..
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
M.E. 14	Pattern Practice	2	..	1	4
Sp. 35‡	Fundamentals of Speech	3	3	..	..
or					
M.E. 50	Auto and Airplane Engines	3	3	..	..
Mil. Sci. 5	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Spring Quarter</i>					
M.&M. 26	Technical Mechanics (Statics)	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
M.E. 16	Forge Practice	2	..	1	4
M.E. 21	Kinematics	2	..	..	6
Sp. 35‡	Fundamentals of Speech	3	3	..	..
or					
M.E. 50	Auto and Airplane Engines	3	3	..	..
Mil. Sci. 6	Second Year Basic Course	0	..	..	3
	Electives*				

* For list of elective courses in other colleges, see page 62.

Programs are arranged to accommodate, C.E. 19f,s Surveying, T. Chem. 1f,w,s Power Plant Chemistry, Phys. 33f,w,s Optics, and other electives. The Power Plant Chemistry sections are limited to 20 students each.

‡ Fundamentals of Speech sections are limited to 25 student each.

JUNIOR YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 127	Technical Mechanics (Dynamics)	5	5	..	..
M.E. 22	Mechanism	3	3	..	..
M.E. 30	Steam Engineering	3	3	..	..
M.E. 33	Elementary Mechanical Laboratory	2	..	..	4
M.E. 71	Machine Shop Practice	3	..	1	7
	Electives*				
<i>Winter Quarter</i>					
M.&M. 128	Strength of Materials	5	5	..	..
M.&M. 141	Materials Laboratory	2	..	1	3
M.E. 23	Machine Design	3	..	2	6
M.E. 31	Thermodynamics	3	2	..	3
M.E. 34	Mechanical Laboratory	2	..	..	4
	Electives*				
<i>Spring Quarter</i>					
M.&M. 129	Hydraulics	4	3	1	..
M.&M. 143	Hydraulics Laboratory	1	..	..	2
M.E. 24	Machine Design	3	3	..	..
M.E. 32	Thermodynamics	3	2	..	3
M.E. 35	Elementary Steam and Power Laboratory	2	..	..	4
	Electives*				

SENIOR YEAR

<i>Fall Quarter</i>					
M.E. 63	Heating and Ventilation	3	1	2	..
M.E. 121	General Engineering Design	2	..	..	6
M.E. 141	Power Plant Engineering	3	3	..	..
M.E. 149	Advanced Steam Laboratory	2	..	..	4
or					
M.E. 159	Power and Gas Engine Laboratory	2	..	..	4
or					
M.E. 169	Heating and Ventilation Laboratory	2	..	..	4
M.E. 150	Internal Combustion Engines	3	3	..	..
M.E. 190	Seminar	1	1	..	..
E.E. 36	Electric Power	3	2	..	2
<i>Winter Quarter</i>					
M.E. 149	Advanced Steam Laboratory	2	..	..	4
or					
M.E. 159	Power and Gas Engine Laboratory	2	..	..	4
or					
M.E. 169	Heating and Ventilation Laboratory	2	..	..	4
M.E. 171	Production Factors	3	3	..	..
M.E. 191	Seminar	1	1	..	..
	Engineering Design†	2	..	..	6
E.E. 37	Electric Power	3	2	..	2
	Electives*				

* For list of elective courses in other colleges, see page 62.

Programs are arranged to accommodate M.E. 72 Machine Shop Practice or other electives.

† The following courses are accepted for this requirement: M.E. 122w-123s, Advanced Engineering Design; M.E. 147w, Design of Steam Machinery; M.E. 148s, Design of Power Plant Units; M.E. 156w, 157s, Design of Internal Combustion Engines; C.E. 37s, Structural Engineering.

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Spring Quarter</i>					
M.E. 149	Advanced Steam Laboratory	2	..	..	4
or					
M.E. 159	Power and Gas Engine Laboratory	2	..	..	4
or					
M.E. 169	Heating and Ventilation Laboratory	2	..	..	4
M.E. 192	Seminar	1	..	1	1
	Engineering Design†	2	..	..	6
E.E. 38	Electric Power	3	2	..	2
G.E. 193	Engineering Practice	2	..	2	..
	Electives*				

In addition to the regular four-year course in Mechanical Engineering, those who are qualified are urged to take a fifth year, that is, a year of graduate study. This year's work may lead to the Master's degree in mechanical engineering and also satisfy the requirement of graduate study towards the professional degree of Mechanical Engineer. (For detailed information as to procedure, the bulletin of the Graduate School should be consulted.)

Graduate work for a degree is divided into a major subject, a minor subject, and a thesis. In this case, the major subject is Mechanical Engineering and the thesis will lie in the same field. The minor should be in another department. If the Master's degree is not sought as a result of the fifth year's work, the thesis is not required. The student is advised to obtain the Master's degree. A total of 15 to 18 credits per quarter, should be taken.

ENGINEERING PRE-BUSINESS

(Combined Engineering-Business Administration Course)

This course has been arranged for students who wish to prepare for positions in industry for which basic technical training is necessary but must be accompanied by thoro training in business administration. Such positions are found in the fields of purchasing, sales and sales promotion, cost accounting, employment and rate setting, and production control.

Upon the completion of two years of prescribed work in the College of Engineering and Architecture, the student transfers to the School of Business Administration, where the third and fourth years are taken. The combined course leads to the degree of bachelor of business administration.

For freshman year, see page 27.

* For list of elective courses in other colleges, see page 62.

† The following courses are accepted for this requirement: M.E. 112w-123s, Advanced Engineering Design; M.E. 147w, Design of Steam Machinery; M.E. 148s, Design of Power Plant Units; M.E. 156w, 157s, Design of Internal Combustion Engines; C.E. 37s, Structural Engineering.

SOPHOMORE YEAR

Course No.	Title	Credits	Rec.	Lect.	Lab.
<i>Fall Quarter</i>					
M.&M. 91†	Calculus	4	4	..	..
Phys. 3	Elements of Mechanics	3	1	3	..
Phys. 4	Elements of Mechanics Laboratory	1	..	..	2
Econ. 8	General Economics	3	..	3	..
M.E. 17§	Machine Shop Practice	2	..	1	4
M.E. 70	Mechanical Technology	1	..	2	..
Mil. Sci. 4	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Winter Quarter</i>					
Phys. 23	Heat	3	1	3	..
Phys. 24	Heat Laboratory	1	..	..	2
Econ. 3	The Mechanism of Exchange	5	3	2	..
Econ. 9	General Economics	3	3	..	..
Econ. 20†	Elements of Accounting	3	3	..	..
Mil. Sci. 5	Second Year Basic Course	0	..	..	3
	Electives*				
<i>Spring Quarter</i>					
M.&M. 84§	Technical Mechanics	5	5	..	..
Phys. 43	Electricity	3	1	3	..
Phys. 44	Electricity Laboratory	1	..	..	2
Econ. 14	Elements of Statistics	5	5	..	..
Econ. 25	Principles of Accounting	3	3	..	..
Mil. Sci. 6	Second Year Basic Course	0	..	..	3

JUNIOR YEAR§

(In the School of Business Administration)

	Credits
Strength of Materials (M. & M. 85f)§	4
Principles of Accounting (Econ. 26f,s)	3
Business Law (Bus. Adm. 51f,s-52w-53s)	9
Corporation Finance (Bus. Adm. 155f,w,s)	3
Money and Banking—Advanced Course (Bus. Adm. 142f,w,s)	3
Traffic Management (Bus. Adm. 71f,w,s)	3
Survey of Marketing (Bus. Adm. 77f,s)	3
Production Management (Bus. Adm. 89f,w,s)	3
Advanced General Accounting (Bus. Adm. 139f,w,s)	3
Report Writing (Bus. Adm. 100f,w,s)	1
Electives (See list below)	7 to 13

* For list of elective courses in other colleges, see page 62.

† Students who have had a high school course or experience in bookkeeping may be exempt from this course and admitted to Econ. 25 by passing a placement test.

‡ For permissible substitute, see page 61.

§ In addition to the required courses in the junior and senior years, the student must earn approximately 10 credits per year.

SENIOR YEAR

(In the School of Business Administration)

Cost Accounting (Bus. Adm. 130f,s)	3
Advanced General Economics (Bus. Adm. 101f,w-102w,s)	6
Business Policy (Bus. Adm. 109w,s)	3
Business Cycles (Econ. 149f,w,s)	3
Labor Problems (Econ. 161f,w,s)	3
Personnel Administration (Bus. Adm. 167w)	3
Public Finance (Bus. Adm. 58f,w,s)	3
The Economics of Public Utilities (Bus. Adm. 165f,w,s)	3
Production Topics Course (Bus. Adm. 180-181-182)	9
Electives (See list below)	12 to 18

ELECTIVES

Students may divide the time available for electives between groups A and B.

A. General and Business

	Hours
Economic History (Hist. 80f-81w)	3 to 6
Finance Management (Bus. Adm. 156f)	3
Theory of Statistics (Econ. 113w-114s)	3
Geography of Commercial Production (Econ. 75f,w,s)	5
Fire and Marine Insurance (Bus. Adm. 60w)	3
Casualty Insurance (Bus. Adm. 61s)	3

B. Engineering

	Hours
Auto and Airplane Engines (M.E. 50f,w,s)	3
Gas Manufacture and Distribution (Ch.E. 41s)	3
Civil Engineering Practice (C.E. 53s)	3
Contracts and Specifications (G.E. 101w)	3
Estimating (G.E. 81f,w,s)	3
Technical Writing (Engl. 31s)	3

ENGINEERING ADMINISTRATION

The following group of elective courses has been prepared for those advanced students in this college who desire a broad training for service in executive and administrative positions. There is an increasing demand for engineers who have such training, and students whose scholastic records are of high grade are encouraged to include this series of electives.

SOPHOMORE YEAR

Course No.	Title	Credits
<i>Fall Quarter</i>		
Econ. 8	General Economics	3
<i>Winter Quarter</i>		
Econ. 9	General Economics	3
<i>Spring Quarter</i>		
Econ. 28	Business Law	3

JUNIOR YEAR		
Course No.	Title	Credits
<i>Fall Quarter</i>		
Econ. 29	Principles of Accounting	3
<i>Winter Quarter</i>		
Bus. Adm. 89	Production Management	3
<i>Spring Quarter</i>		
Bus. Adm. 155	Corporation Finance	3
SENIOR YEAR		
<i>Fall Quarter</i>		
Bus. Adm. 77	Survey of Marketing	3
Econ. 161	Labor Problems and Trade Unionism	3
<i>Winter Quarter</i>		
Bus. Adm. 71	Traffic Management	3
Bus. Adm. 167	Personnel Administration	3
<i>Spring Quarter</i>		
Bus. Adm. 130	Cost Accounting	3
Bus. Adm. 165	The Economics of Public Utilities	3

SUBSTITUTIONS

In order that students who are irregular may avoid delays on account of program conflicts or other difficulties, the following substitutions will be approved by petition. Additional credits thus earned may be applied as elective credits.

Course	Cred.	Substitute Course	Cred.
Draw. 4	2	Draw. 1	3
5	2	2	3
6	2	3	3
4 and 5 and 6	6	7 and 8	6
26	2	28	2
28	2	26	2
M.&M. 84	5	M.&M. 26 and 127	10
85	4	128 and 141	7
86	2	129	4
91	4	24 and 25	10
92	4	26 or 84	5
93	4	85 or 128	4 or 5
M.E. 17	2	19	2
19	2	17	2
19	2	71	3

ELECTIVE COURSES IN OTHER COLLEGES

For detailed schedules of classes see the programs of respective departments.

Course No.	Title	Credits	Prerequisites
Ast. 11f,s	Descriptive Astronomy	5	3rd qtr. fr., soph., jr., sr.; none
Fr. 1f,w,s-2f,w,s	Beginning French	10	None
Fr. 3f,w,s-4f,w,s	Intermediate French	10	French 1-2 or two years' high school French
Geog. 1f-2w	Introduction to Human Geography	10	None
Geog. 11f,w,s	Human Geography	5	3rd qtr. fr., soph., jr., sr.; none
Geol. 4s	Geology of Minnesota	5	Geol. 2 or 3
Geol. 8f,w,s	Introductory Geology	5	None
Geol. 161w	Crystal Structures	3	Geol. 121, M.&M.13 and Elem. Phys.
Ger. 1f,w,s	Beginning German A	5	None
Ger. 2f,w,s	Beginning German B	5	Ger. 1 or one year preparation
Ger. 3f,w,s	Beginning German C	5	Ger. 2
Ger. 4f,w,s	Intermediate German	5	Ger. 3
Greek 42s	Greek Sculpture	2	None
Hist. 1f,w-2w,s	Modern World History	10	None
Hist. 7f-8w	American History	10	None
Hist. 11f-12w-13s	Medieval History	10	None (Int. Arch. only)
Hist. 17s	Europe in the Middle Ages	5	10 cred if taken by fr.
Italian 1f-2w	Beginning Italian	10	None
Jour. 5w,s	The American Newspaper	3	None
Jour. 13f-14w-15s	Reporting	9	Engl. 6
Lib. Meth. 1f,w,s	Use of Books and Libraries	2	None (fr. and soph. only)
Phil. 2f,w,s	Logic	5	None
Phys. 146w	Advanced Electrical Measurements	3	Phy. 144
Pol. Sci. 1f,w,s	American Government and Politics	5	10 cred. in hist. or econ.
Psy. 1f,w,s-2w,s	General Psychology	6	None
Psy. 160f	Psychology in Personnel Work	3	Psy. 1-2, Econ. 8 9
Soc. 1f,w,s	Introduction to Sociology	5	None
Span. 1f,w,s-2f,w,s	Beginning Spanish	10	None
Span. 3f,w,s-4f,w,s	Intermediate Spanish	10	Spanish 1-2 or two years' high school Spanish
Sp. 41f,w-42w,s-43f,s	Fundamentals of Speech	9	Engl. 6

DESCRIPTIONS OF COURSES

AERONAUTICAL ENGINEERING

- 1f—Aviation. History of nomenclature. Resistance of simple bodies. Theory of flight. The airplane and its parts. Constructional details. Performance. 3 cred.; prereq., M.&M. 12. Mr. Knoblock.
(1) I MWF; 202ME (2) I TThS; 202ME
- 2w—Auto and Airplane Engines. Principles and types. Electrical systems. Lubrication and cooling. Carburetors. Accessories. (Open only to aeronautical engineers or by petition.) 3 cred.; prereq., 1. Mr. Knoblock.
(1) IV T, VI Th, III S; 202ME (2) III MWF; 202ME
- 3s—Aviation. Instruments. Meteorology. Avigation. 3 cred.; prereq., 1 and 2. Mr. Knoblock.
(1) I T, II WF; 202ME (2) II TThS; 202ME
- 83s—Stresses in Simple Structures. Statically determinate trusses and beams. Graphic statics. Space frameworks. Combined stresses. Airplane wing bracing. Short and long struts. 3 cred.; prereq., M.&M. 128; III MWF; 5E. Mr. Wise.
- 100f-101w-102s—Aerodynamics. Atmospheric properties. Fluid mechanics. Stream functions and velocity potential. Motion of body in liquids in three dimensions. Prandtl's wing theory. Dynamic loads, stability, maneuverability, controllability. 3 cred. per qtr.; prereq., 3 and M.&M. 25; I MWF; 139EE(f), 22E(w), 215Ex(s). Mr. Boehlein.
Lect. III TS; 21E Lab. III-IV F; 229E
- 115f—Airplane Stresses. Deflection of structures. Theory of statically indeterminate structures. Analysis of fuselage trusses, landing gear, wing beams. Structural details and connections. 3 cred.; prereq., 83. Mr. Wise.
- 116w—Advanced Airplane Stresses. Theory and design of monocoque fuselages. Multispar and unit construction wings. Vibrations. Wing and control-surface flutter. Analysis and design of seaplane hulls and floats. 3 cred.; prereq., 115. Mr. Wise.
- 120f-121w-122s—Airplane Design. Stress analysis of wings, fuselages, chassis, control surfaces, etc. Specifications. Performance and design calculations. Propellers. 120f, 2 cred.; 121w, 4 cred.; 122s, 3 cred.; prereq., 83, 102, M.&M. 128. Messrs. Akerman and Knoblock.
120f Lect. IV S; 202ME Lab. VII-IX T; 251ME
121w Lect. II T; 202ME Lab. VII-IX TF; 251ME
122s Lect. IV T; 202ME Lab. I-III MF; 151ME
- 123f,w,s-124f,w,s-125f,w,s—Advanced Airplane Design. Problems in airplane design or development. 2 to 5 cred. per qtr.; prereq., 121. Mr. Akerman.
- 126f,w,s-127f,w,s-128f,w,s—Advanced Problems in Airscrew Design. Graphical and analytical methods of investigation. 2 to 5 cred. per qtr.; prereq., 122. Mr. Akerman.
- 140f—Aeronautical Laboratory. Study of airplane parts and their construction. Fittings. Rigging. Inspection and accessories. 2 cred.; prereq., 102; VII-IX WF; Ex. Messrs. Akerman and Knoblock.

- 141w—Aerodynamics Laboratory. Measurement of air flow. Calibration of Pitot tubes and anemometers. Distribution of air pressure on surfaces. Wind tunnel tests of wings, propellers and airplane models, 2 cred.; prereq., 102; VI-VIII MTh; Ex. Messrs. Boehnlein and Knoblock.
- 160s—Airships. Theory and design. Rigid and non-rigid types. Stresses. Performance. 3 cred.; prereq., 83, 102, M.&M. 128. Mr. Akerman.
Lect. II TS; 254ME Lab. I-III W; 151ME
- 170s—Air Transport. Economics. Airports and airways and their equipment. Air commerce rules and regulations. Communication. 2 cred.; prereq., open to sr.; IV MW; 252ME.
- 190f-191w-192s—Seminar. Readings, reports, conferences, and discussions. 1 cred. per qtr.; prereq., 102. Mr. Akerman.
190f VI T; 202ME 192s VII M; 202ME
191w IV T; 154ME
- 260s—Advanced Airship Stresses. Coplanar and space rigid frameworks. Secondary stresses. Buckling and elastic instability. Framework of dirigibles, gondolas, and cabins. 3 cred.; prereq., 115. Mr. Wise.
- 272f-273w-274s—Research in Aeronautical Engineering. 2 to 5 cred. per qtr.; grad. Messrs. Akerman, Boehnlein, and Wise.

AGRICULTURAL BIOCHEMISTRY

- 113f,su-114w,su-115s—Biochemical Laboratory Methods. A laboratory course paralleling the lectures in 111-112. 2 cred. per qtr.; prereq., quantitative analysis, reg. in 119-123. VI-VIII T; VII-IX Th; 202-208 BCh(UF). Mr. Sandstrom.
- 119f—Colloids. Lectures and assigned readings dealing with the colloidal state of matter, the preparation and properties of colloidal systems, and the relation of these to biochemical processes. 3 cred.; prereq., Org. Chem. 53 and one year of either zoology or botany. III MWF; 113 BCh(UF). Mr. Gortner.
- 120w—Proteins. Lectures and assigned readings on composition, structure, chemical and physical properties, and the functions of proteins and amino acids. 3 cred.; prereq., 119. II MWF; 113 BCh(UF). Mr. Gortner.
- 121w—Carbohydrates. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the carbohydrates. 3 cred.; prereq., 119. III MWF; 113BCh(UF). Mr. Bailey.
- 122s—The Lipids and Fats. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the fats and fat-like compounds. 3 cred.; prereq., 119. III TThS; 113BCh(UF). Mr. Bull.
- 123s—Enzymes. Lectures and assigned readings on enzyme action, including the methods of preparation and investigation of enzymes and their function in biological and industrial processes. 3 cred.; prereq., 119; III MWF; 113BCh(UF). Mr. Sandstrom.

AGRICULTURAL ECONOMICS

- 102w—Farm Management: Organization. Business side of farming is emphasized. Special attention is given to farm organization and equipment. 3 cred.; prereq., Ag.Econ. 2; II TThS; 312HH(UF). Mr. Garey.
103s—Farm Management: Operation. Special attention is given to farm operation. 3 cred.; prereq., 102; II TThS; 312HH(UF). Mr. Garey.

AGRICULTURAL ENGINEERING

FARM BUILDINGS

- 5w—Farm Building Design and Construction. Instruction and practice in design of details, and in construction of farm buildings. 3 cred.; no prereq. Messrs. White and Berggren.
Lect. III M; 41En(UF) Lab. III-IV WF; 48En(UF)
- 7s—Farm Structures I. Arrangement, planning, and designing of farm buildings. Special attention to convenience, economy, and the durability. 3 cred.; prereq., Dr. 3 or equiv. Mr. White.
Lect. I T; 305En(UF) Lab. I-II ThF; 305En(UF)
- 37w—Rural Sanitation. Wells, pumps, and water supply. Methods of securing sanitary water systems for farmsteads and rural institutions. Sanitary sewage disposal methods for homes, creameries, etc. 3 cred.; no prereq.; I MWF; 101En(UF). Mr. Tyler.
- 67s—Farm Structures II. Planning, estimating, and construction of farm buildings. Study of materials commonly used. 3 cred.; prereq., 7, M.&M. 128; 305En(UF). Mr. White.
- 111f-112w-113s—Farm Building Problems. Investigations in building materials, methods of construction, cost and efficiency of farm buildings. 3 to 6 cred. per qtr.; prereq., 67; ar.; 305En(UF). Mr. White.
- 211f-212w-213s—Farm Structure Research. Studies in farm structures as related to other factors in the farm business. 3 to 6 cred. per qtr.; prereq., 111; ar. Mr. White.

FARM MACHINERY

- 12s—Field Machinery. Construction, operation, adjustment, and use of soil preparation, seeding and harvesting machinery. 3 cred.; no prereq. Mr. Schwantes
Lect. I MW; 216En(UF) Lab. II-IV T; 49En(UF)
- 13s—Gas Engines. Theory, operation, care, and repair of gasoline engines. 3 cred.; no prereq.; VI-VIII TTh; 216, 37En(UF). Mr. Torrance.
- 14f—Tractors. Lecture and laboratory course dealing with the construction, operation, care, adjustment, testing, and use of the tractor. 3 cred.; prereq., 13. Mr. Torrance.
Lect. II TTh; 216En(UF) Lab. VI-IX F; 37En(UF)
- 15f—Ignition and Carburetion. Lecture and shop study of the construction and action of the various forms of ignition and carburetion systems in use on gas engines of all types. 3 cred.; prereq., 13; III MW, III-IV F; 216En(UF). Mr. Torrance.

- 43f—Mechanical Laboratory. Instruction and laboratory practice in mechanical work, embracing cement work; soldering; welding; pipe fitting; electric wiring; harness repair, etc. 3 cred.; no prereq.; I-III ThS. Mr. Dent.
- 70f—Steam Boilers and Engines. Construction, operation, and care of simple steam engines and boilers. 3 cred.; prereq., Phys. 23, 24; II TThS; 216En(UF). Mr. Boss.
- 71f—Power Machinery. Study of machines requiring mechanical power for their operation such as feed grinders, corn shredders, ensilage cutters, threshers. 3 cred.; prereq., 12, 13; VI MW; 106En(UF), VII-IX W, 49En(UF). Mr. Schwantes.
- 72w—Applied Electricity. Laboratory work in direct and alternating current machines as used on farms, including generators, motors, storage batteries, transformers, and complete isolated electric and hydroelectric plants (offered only in alternate years, 1932-33, etc. Alternates with Soils 108). 3 cred.; prereq., Phys. 43, 44; ar.; 101En(UF). Mr. Romness.
- 121f-122w-123s—Farm Power and Machinery Problems. Special studies of farm machinery and mechanical power for the farm. Tests, design, and adaptability to various farm conditions. 3 to 6 cred. per qtr.; prereq., 126; ar. Mr. Schwantes.
- 126s—Selection of Farm Equipment. Types, sizes, and quantity of power and machine units for various types of farming. 3 cred.; prereq., 14, 71, M.E. 27, Ag.Econ. 103; III MW; 106En(UF), III-IV F; 49En(UF). Mr. Schwantes.
- 221f-222w-223s—Farm Power and Machinery Research. Studies involving the design or utilization of power machinery used in connection with farm operation. 3 to 6 cred. per qtr.; prereq., 121; ar. Mr. Schwantes.

RECLAMATION

- 19f—Elementary Surveying. Use of tape, transit, level, and traverse board in field problems, e.g., mensuration surveys, traverses, differential and profile leveling; plotting and mapping. Care and adjustment of instruments. 3 cred.; prereq., Dr. 3, M.&M. 12. Messrs. Neal and Howe.
Lect. III T; 105En(UF) Lab. VI-VIII TTh; 305En(UF)
- 20s—Advanced Surveying. Topographic surveys by stadia and other methods, running simple curves, cross sectioning, plotting the survey, profile building, grade determination, and figuring of quantities in earth work. 3 cred.; prereq., 19. Messrs. Neal and Howe.
Lect. VI M; 105En(UF) Lab. VII-IX MF; 305En(UF)
- 28w—Land Clearing. Land clearing methods, explosives, and machinery. Farm development in cut over timber district. 3 cred.; no prereq.; I TThS, 103En(UF). Mr. Schoenleber.
- 31f,w,s—Principles of Drainage. Elementary principles and practice of soil erosion control and of drainage in relation to plant growth, crop and land values, and farm operation and development. 3 cred.; no prereq.; III TThS; 105En(UF). Messrs. Roe and Neal.
- 42s—Principles of Irrigation. Irrigation and the development of arid and semi-arid lands, irrigation practices; duty of water and water rights; correlation

- of drainage and irrigation. 3 cred.; no prereq.; II TThS; 105En(UF). Mr. Roe.
- 68f—Drainage Engineering and Works. Design, location, and construction of public and private drainage systems and works; construction estimates, drainage engineering, and public records. 3 cred.; prereq., 31, M.&M. 86; I M, II-IV MF; 105En(UF). Mr. Roe.
- 69s—Irrigation Engineering and Works. Design, location, and construction of irrigation works; reservoir and transmission losses; general irrigation law; irrigation engineering and public records. 3 cred.; prereq., 42, M.&M. 86; I M, II-IV MW; 105En(UF). Mr. Roe.
- 101f-102w-103s—Advanced Drainage Problems. Special drainage problems including surface run-off, soil permeability, relation of soil and crop type to drainage, shape and regulation of water table in relation to root growth, etc. 3 to 6 cred. per qtr.; prereq., 68; ar.; 105En(UF). Messrs. Roe and Neal.
- 201f-202w-203s—Reclamation Research. Studies of design and functioning of reclamation work with special reference to soil types and soil water conditions. 3 to 6 cred. per qtr.; prereq., 101 and one qtr. Mathematical Theory of Statistics; ar. Mr. Roe.

GENERAL

- 91f-92w-93s-94f-95w-96s-97f-98w-99s—Agendum. General agricultural engineering seminar. Official conference of entire group: topics of broad general interest to agricultural engineers discussed; as, for example, research problems, government service, agricultural engineering functions and developments. All staff members and all students above freshman classification required to attend. No cred.; no prereq. Mr. Boss and staff.
- 91f-94f-97f I T (third T. of each month); 107En(UF)
 92w-95w-98w IX F (third F. of each month); 107En(UF)
 93s-96s-99s VII W (third W. of each month); 107En(UF)
- 150s—Seminar (Ag.E.). Students will give reports of their investigations on certain assigned problems for research. 2 cred.; prereq., required of all sr. Messrs. Roe, Schwantes, and White.

AGRONOMY AND PLANT GENETICS

- 1f,s—Farm Crops. Important field crops of the United States with emphasis upon those of local importance, distribution, economic importance, agricultural classification, cultural methods, and principles of improvement and seed selection. 3 cred.; no prereq.; III-IV MWF; 2Ad(UF). Mr. Johnson.

ANIMAL HUSBANDRY

- 15s—Fundamentals of Livestock Production. Basic principles involved in the breeding, feeding, and management of livestock. 3 cred.; jr., sr.; no prereq.; I TThS; 3St(UF). (For professional agricultural engineering students only.) Mr. Peters.

ARCHITECTURE

GENERAL

11f-12w-13s—Introduction to Architecture. Orientation course. Architecture in its relations to civilization. Architecture in theory and practice. 1 cred. per qtr.; no prereq.; III Th; 305E. Faculty of Architecture.

HISTORY

14f-15w-16s—Architectural History. Technical study of architecture: (f) Ancient Egypt, Assyria, Persia, and especially Greece; (w) Ancient Rome and beginning of the Renaissance in Italy; (s) Renaissance in Italy and Spain. Illustrated lectures and library research. 2 cred. per qtr.; prereq., 22, 32; III WF; 305E. Mr. Mann.

17f-18w-19s—Architectural History. Technical study of architecture: (f) The Middle Ages in Italy, France, and England; (w) Developed Gothic architecture and early Renaissance in France and England; sources and affecting influences; (s) Development from the seventeenth century to the present time, particularly in France, England, and America. Lectures and library research. 2 cred. per qtr.; prereq., 15 for 17 and 18, 16 for 19; III TTh; 320E. Mr. Mann.

219f,w,s—Special Researches in Architectural History. 5 cred. or less per qtr.; prereq., completion of undergraduate architectural history; ar. Mr. Mann.

FINE ARTS

20su—Sketching. Sketching out-of-doors in water color and other media. 1 cred.; prereq., 23 or evidence of intermediate ability. Mr. Young.

(1) I-III MW

(3) III-V MW

(2) I-III TTh

(4) III-V TTh

21f,w,s,su-22w,s,su-23s,su—Freehand Drawing. Freehand perspective; pencil, charcoal, and wash drawings from geometric solids and architectural details. 2 cred. per qtr.; no prereq. Messrs. Young and Doseff.

21f (1) II-III TS, I-II Th; 417E

(3) VI-VII MF, VIII-IX T; 417E

(2) VI-VII TWTh; 417E

(4) VIII-IX MWF; 417E

21w I-II MWS; 417E

22w (1) VIII-IX TF; VII-VIII Th; 417E

(3) I-II TTh, II-III F; 417E

(2) VI-VII MWF; 417E

22s VIII-IX WF, VI-VII Th; 417E

23s (1) III-IV T, I-II F, II-III S; 417E

(3) VIII-IX, MTh, VII-VIII T; 417E

(2) VI-VII MWF; 417E

24f,w,su-25f,w,s,su-26f,w,s,su—Freehand Drawing. Drawing in charcoal and water color from still life, figure details, and the antique. 2 cred. per qtr.; prereq., 23. Messrs. Young and Doseff.

24f,w-25f,w-26f,w II-IV TS; 417E

25s-26s II-IV T, I-III S; 417E

27f,w,s,su-28f,w,s,su-29f,w,s,su—Freehand Drawing. Drawing and painting from architectural detail, from the antique, and from life. 2 cred. per qtr.; prereq., 26; I-III MW; 417E. Mr. Burton.

40su—Painting. Still life, head and figure, landscape. 3 or 6 cred.; prereq., evidence of elementary ability; VI-VII MWF; 405E. Mr. Young.

- 41su—Sculpture. Modeling in clay. Head, figure, and composition. 3 or 6 cred.; prereq., evidence of elementary ability; I-III MWF; 405E. Mr. Burton.
- 68s—Time Studies from Life. Drawing from head life and the costumed figure, in any medium. 1 cred.; no prereq. Mr. Burton.
- 70f,w,s—Pictorial Composition. Study of the arrangement of the pictorial art of all ages. Original compositions in all mediums. 1 cred.; prereq., 26 or equiv.; VI-VIII T; 405E. Mr. Burton.
- 74f-75w-76s—Freehand Drawing. Similar to Courses 24, 25, and 26. For students in Interior Architecture. 3 cred. per qtr.; prereq., 23; II-IV MTS; 417E. Mr. Young.
- 84f,w,s-85f,w,s-86f,w,s—Modeling. Elementary course in clay modeling. Ornament, heads, and animals from casts and from life. 2 cred. per qtr.; prereq., 23; VI-VIII MW; 405E. Mr. Burton.
- 87f,w,s-88f,w,s-89f,w,s—Advanced Modeling. 2 cred. per qtr.; prereq., 86; VI-VIII MW; 405E. Mr. Burton.
- 90f,w,s-91f,w,s-92f,w,s—Illustration. Design of illustration as applied to the printed page. Magazine illustration, posters and books. 1 cred. per qtr.; prereq., 23; VI-VIII T; 405E. Mr. Young.
- 93f,w,s-94f,w,s-95f,w,s—Hand Print Processes. Making and printing wood engravings, etchings, drypoints, and lithographs. 1 cred. per qtr.; prereq., 23; VI-VIII T; 405E. Mr. Young.
- 121f,w,s,su-122f,w,s,su-123f,w,s,su—Freehand Drawing. Advanced life drawing, painting, or modeling and decoration. 2 cred. per qtr.; prereq., 29; VI-VIII MW; 405E. Mr. Burton.
- 163s—History of Sculpture and Painting. Study of ancient Renaissance and modern sculpture, and of the Renaissance and modern schools of painting. 2 cred.; prereq., Arch. 16; IV T; 206E; I F; 320E. Mr. Burton.
- 220f,w,s—Archeology. 3 cred. or less per qtr.; prereq., completion of undergraduate architectural history; hrs. ar. Mr. Arnal.
- 221f,w,s,su-222f,w,s-223f,w,s—Life Drawing and Figure Composition. 2 cred. per qtr.; prereq., completion of undergraduate freehand drawing; hrs. ar. Mr. Burton.
- 287f,w,s-288f,w,s-289f,w,s—Advanced Modeling. Continuation of Arch. 89. 2 cred. per qtr.; prereq., 89; hrs. ar.; 405E. Mr. Burton.

DESIGN

- 31f,su-32w,su-33s,su—Architectural Design. Elements of architecture. Architectural drawing, and wash rendering. Elements of architectural design; walls, doors, windows, colonnades, arcades, moldings, vaults, etc. Relation of building materials to design. 3 cred. per qtr.; no prereq. Mr. Heath.
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|-----|--------------------|------------------------------|
| 31f | Lect. III MW; 320E | Lab. I-II M, VI-IX Th; 309E |
| 32w | Lect. III MW; 320E | Lab. I-II M, VII-IX Th; 309E |
| 33s | Lect. III MW; 320E | Lab. VI-VIII TTh; 309E |

*34f,w,s,su-35f,w,s,su-36f,w,s,su—Architectural Design, Grade I. Long and short problems under individual criticism dealing in general with the elements of plan and elevation. Sketch problems dealing with composition. 4 cred. per qtr.; prereq., 23, 33, 62. Messrs. Beals and Havens.

(Arch.) (f,w) VII-IX MTThF, VI-VIII T; 401E (Arch.E.) (f) II-IV MTS, II-III Th; 401E
(w) II-IV MTS, I-II F; 401E
(s) VI-VIII MWThF; 401E (s) II-III M, II-V T, II-III Th
I-IV S; 401E

*37f,w,s-38f,w,s-39f,w,s—Architectural Design, Grade II. Long and short problems under individual criticism dealing with simple architectural composition. Sketch problems dealing with large composition or decorative detail. 7 cred.† per qtr.; prereq., 36. Mr. R. C. Jones.

(f) VI-VIII MWF, VI-IX TTh, I-IV S; 302E
(w,s) VI-IX MTTh, VI-VIII WF, II-IV S; 302E

*131f,w,s-132f,w,s-133f,w,s—Architectural Design, Grade III. Long, short, and sketch problems under individual criticism dealing with complex compositions and with subjects involving special character and a decorative and imaginative interest. 10 cred. per qtr. for 131 and 132, 9 cred.‡ for 133; prereq., 39. Mr. Arnal.

131f-132f-133f I-II MWF, VI-IX MTWThF, I-IV S; 317E
131w-132w-133w I-II M, III-IV TF, VI-IX MTWThF, I-IV S; 317E
131s-132s-133s III-IV WF, VI-IX MTWThF, I-IV S; 317E

140—Thesis. An original problem in architecture chosen and developed by the individual student, with the approval and advice of the architectural faculty. At least one quarter should be allowed for its completion. 8 cred.; prereq., 133 or 146. Faculty of Architecture.

239f,w,s—Advanced Architectural Design. 10 cred. or less per qtr.; prereq., completion of undergraduate design; VI-IX MTWThF, I-IV S; 317E. Mr. Arnal.

CONSTRUCTION

44f-45w-46s—Building Construction. General study of the principles, methods, and materials involved in the design of ordinary masonry and frame construction. 2 cred. per qtr.; prereq., 33. Mr. R. T. Jones.

Lect. I MW; 133Ph
Quiz. (1) III M; 203E(f),206E(w,s) (3) III Th; 203E(f), 206E(w,s)
(2) II W; 320E

47f-48w-49s—Building Construction (Arch.E.). Detailed study of the principles, methods, and materials involved in the design of all systems of light and heavy construction. 2 cred. for 47-48, 3 cred. for 49; prereq., 35 and 46. Messrs. Heath and Deneen.

47f VI-VIII TTh; 225E
48w VI-VIII TTh; 225E
49s VI-VIII TW; 225E

* Work in all design courses is carried on simultaneously and students pass from one grade to the next in sequence in varying lengths of time according to their accomplishment and irrespective of university time units. The normal time required to complete the design courses is three years; some students require more time and some less. Advancement is based upon design "points" earned. For graduation, in addition to a passing grade in each quarter's work, the student must earn 192 points in Grade I, 336 points in Grade II, and 480 points in Grade III.

† Course 37-38-39 carries 6 cred. per qtr. for students entering 1932.

‡ Course 131-132-133 carries 8 cred. per qtr. for students entering 1932.

- 51f-52w-53s—Building Construction (Int.Arch.). Non-technical study of the principles, methods, and materials of ordinary construction, particularly as related to domestic architecture and interior finish. 2 cred. per qtr.; prereq., 33; I TTh; 320E. Mr. R. T. Jones.
- 141f-142w-143s—Building Construction. Advanced study of the technology of building materials, soils, foundations, systems of framing, and fireproof and mill construction. 2 cred. per qtr.; prereq., C.E. 41 or M.&M. 26; II TTh; 203E(f), 215E(w), 22E(s). Mr. R. T. Jones.
- 144f-145w-146s—Construction Design. Problems in design involving the structural and economic phases of buildings. 6 cred. per qtr.; prereq., Arch. 39, 43, C.E. 39, 41. Mr. R. T. Jones and others.
- 240f,w,s—Technology of Building Materials. 3 cred. per qtr.; prereq., 49 or 143; hrs. ar. Mr. R. T. Jones.

INTERIOR ARCHITECTURE

- 81f,w—Stage Design. Making of original models to solve stage problems in design. Form and color. For students interested in dramatics. 2 cred.; no prereq.; VI-VIII TTh; 405E. Mr. Burton.
- 82w—Advanced Stage Design. Original models and costumes for actual productions. 2 cred.; prereq., 81; VI-VIII TTh; 405E. Mr. Burton.
- *134f,w,s-135f,w,s-136f,w,s—Interior Design (Int.Arch.). Problems done under individual criticism dealing with the decorative treatment, furniture, and accessories of interiors. 7 cred. per qtr.; prereq., 36; VI-VIII WF, VI-IX MTTh, I-III S; 317E. Mr. Arnal.
- 161f—Decoration and Applied Arts. Historical and technical study of decoration, furniture, etc., together with discussion of the use of color. 2 cred.; prereq., 16, 26; IV TF; 320E. Miss Carter.
- 180su—Architecture and Decoration. History and appreciation of interior architecture, furniture, and decoration. Illustrated lectures and research. 2 cred.; no prereq.; IV TWF. Mr. Mann.
- 182f-183w-184s—Furniture and Decoration. Historical and technical study of ornament, decoration, furniture, textiles, etc. Discussion of the use of color in decoration. Interior perspective. 3 cred. per qtr.; prereq., 16, 23 for 182-183; 36 for 184; II TThF; 320E. Miss Carter.
- 243f,w,s—Advanced Interior Design. 10 cred. or less per qtr.; prereq., 136; hrs. ar. Mr. Arnal.

LANDSCAPE ARCHITECTURE

- 160f—History of Landscape Architecture. Study of landscape architecture in Italy, France, England, and America. 2 cred.; prereq., 16. (Not offered in 1932-33.)

* Work in all design courses is carried on simultaneously and students pass from one grade to the next in sequence in varying lengths of time according to their accomplishment and irrespective of university time units. The normal time required to complete design courses is three years; some students require more time and some less. Advancement is based upon design "points" earned. For graduation, in addition to a passing grade in each quarter's work, the student must earn 192 points in Grade I, 336 points in Grade II, and 480 points in Grade III.

- 162w—Landscape Design. Theory and practice. Lecture and design problems. 2 cred.; prereq., 39; IV MW; 320E. Mr. Nichols.
- 164s—Landscape Design. Particular attention to the relation of buildings to their sites and surroundings. 2 cred.; prereq., 162. (Not offered in 1932-33.)

RELATED SUBJECTS

- 151f—Architectura! Seminar. Literature of architecture, special topics, papers, and discussions. 1 cred.; prereq., sr. standing; IV M; 320E. Mr. Mann.
- 152w—Estimating. Principles of the quantity survey; cost analysis. 1 cred.; prereq., sr. standing; I Th; 215E. Mr. Sault.
- 153s—Business Relations. Relations of the architect, owner, and builder; professional ethics and practice; office administration. 2 cred.; prereq., sr. standing; II WF; 206E. Mr. Mann.
- 154w—Acoustics of Buildings. Theory and applications in practice. 1 cred.; prereq., sr. standing; III M; 21E. Mr. Mann.

ASTRONOMY

- 51w—General Astronomy. A survey course covering the fundamental facts and principles of astronomy. 3 cred.; prereq., M.&M. 12; IV MWF; 133Ph. Mr. Luyten.
- 101f—Celestial Mechanics. 3 cred.; prereq., M.&M. 25; II MWF; Ph. Mr. Luyten.
- 140f—Method of Least Squares. The combination and adjustment of observations and the discussion of their precision as applied especially to engineering, physics, astronomy, and psychology. 3 cred.; prereq., 51 or 11 and M.&M. 12; ar., Ph. Mr. Luyten.

BACTERIOLOGY AND IMMUNOLOGY

- 41f,w,s,su*—General Bacteriology. The principles and technique of general bacteriology; studies in the morphologic and biologic characters of the common bacteria; culture media; principles of sterilization and disinfection; examination of air, water, milk, food; relation of bacteriology to the industries. Lectures and laboratory. 5 cred.; prereq., Zool. 16 or 9 cred. of botany, and Inorg. Chem. 10; VII-IX MWF. Mr. Halvorson and Mrs. Green.
- 121w—Industrial Bacteriology. The physiology of micro-organisms with particular reference to the metabolism of carbohydrates, proteins, and fats, and its bearing on the industrial fermentations. 3 cred.; prereq., 41; I TThS. Mr. Halvorson.
- 122s—Industrial Bacteriology. Bacteriology of foods, water, and sewage including a study of the evaluation of bacteriological data. 3 cred.; prereq., 41; I TThS. Mr. Halvorson.

* Microscope fee of \$1.50 is charged for this course.

BOTANY

1f,w,s—General Botany. Structure, physiology, life histories, and evolution of plants. Lectures and quizzes. 4 cred.; no prereq. Mr. Huff.

1f	Lect. Bot. Aud. (1) III TThS	(2) VI T, VI-VII Th
	Quiz Bot. Aud. (1) III M	(5) VI M
	(2) II T	(6) VII T
	(3) III W	(7) I M
	(4) V T	(8) IV T
1w,s	Lect. III TThS, Bot. Aud.	
	Quiz Bot. Aud. (1) I T	(3) III W
	(2) II T	

7f,s—Taxonomy of Flowering Plants. A general study of the classification and relationship of flowering plants. 3 cred.; prereq., 1. Mr. Rosendahl.

7f I-II MWF; 1, 4, 5, 8 Bot.

7s (1) I-II MWF; 1, 4, 5, 8 Bot. (2) VI-VIII TTh; 1, 4, 5, 8 Bot.

21f,w,s—Elementary Ecology. An introductory course in the study of plants in relation to their environment. 3 cred.; prereq., 1. Mr. Cooper.

21f III-IV MWF; 1, 4, 5, 8 Bot.

21w Lect. VI TTh, Bot. Aud.

Lab. (1) VII-VIII TTh;

(2) I-II ThS; 1, 4, 5, 8 Bot.

1, 4, 5, 8 Bot.

INORGANIC CHEMISTRY

(A fee of \$2 per quarter is charged for Courses 1 to 17, inclusive.)

1f,su-2w-3s—General Inorganic Chemistry. 1. Study of general laws of chemistry and of the non-metals and their compounds. 2. Continuation of Course 1. 3. Metals and their compounds. Continuation of Course 2. 4 cred. per qtr.; no prereq. Messrs. Glockler and Pervier.

(1) (Pre-med., pre-dent.)

Lect. VI MWF; 225C

Lab. (1) VII-IX T; 290C

Quiz. (1) VI T; ar C

(2) VII-IX Th; 290C

(2) VI Th; ar C (Pre-dent)

(2) (Agr., jr. arch. engr.) fall, winter

Lect. VII MWF; 225C

Lab. VIII-IX MW; 210C

(2) (Agr., jr. arch. engr.) spring

Lect. VII MF; 100C; IV S; 225C

Lab. VIII-IX MF; 210C

4f,su-5w,su—General Inorganic Chemistry. Study of the general laws of chemistry and of the non-metals and their compounds. More intensive than Course 1f-2w-3s. 4 cred. per qtr.; prereq., high school chemistry. Messrs. Stephens, Heisig, and Maynard.

- 4f (Engrs.)
 Lect. (1) I TThS; 100C
 (2) IV T; 225C; VI Th, IV S; 100C
 (3) I TThS; 100C
 Quiz (1) and (3) VIII M; 100C
 (2) III M; 100C
 (Pre-med., pre-dent)
 Lect. (4) VI MWF; 100C
 Quiz (1) VI T; ar C or
 (2) VI Th; ar C
 Lab. (1) II-IV T; 110C
 (2) II-IV F; 110C
 (3) II-IV W; 110C
 (1) VII-IX T; 210C
 (2) VII-IX Th; 210C
- 5w (Engrs.)
 Lect. (1) I TThS; 100C
 (2) IV T; 225C; VI Th, IV S; 100C
 (3) I TThS; 100C
 Quiz (1) and (3) VIII M; 100C
 (2) VI T; 100C
 (Pre-med., pre-dent.)
 Lect. (4) VI MWF; 100C
 Quiz (1) VI T; ar C
 (2) VI Th; ar C
 Lab. (1) III-V T; 110C
 (2) I-III F; 110C
 (3) II-IV W; 110C
 (1) VII-IX T; 210C
 (2) VII-IX Th; 210C
- 6f,su-7w-8s—General Inorganic Chemistry. 6. Includes a study of general laws of chemistry and of non-metals and their compounds. 7. Continuation of Course 6. 8. Study of metals and their compounds. 5 cred. per qtr.; no prereq. Miss Cohen.
 Lect. II MWF; 225C
 Lab. I-III ThS; 210C
- 9f,w,su-10w,s,su—General Inorganic Chemistry. Course 9. A study of general laws of chemistry and of non-metals and their compounds. More intensive than Courses 6 and 7. Course 10. The metals and their compounds. 5 cred. per qtr.; prereq., one year of high school chemistry. Messrs. Sneed and Reyerson, Miss Cohen, and Mr. Maynard.
 9f-10w Lect. (1) (Agr.) VII MWF; 100C
 (2) (Chem., S.L.A.) II MWF; 100C
 Lab. (1) VIII-IX MWF; 110C
 (2) I-III ThS; 290C
 9w-10s Lect. (1) III MWF; 225C
 Lab. VI-VII MWF; 210C, 290C
 (2) III MWF; 100C
- 11f,s,su—Qualitative Chemical Analysis. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibria, oxidation and reduction, etc. 4 cred.; prereq., 3 or 5. Miss Cohen, Mr. Stephens.
 11f Lect. IV MWF; 225C
 Lab. VI-IX F; 210C
 11s Lect. VI MWF; 100C
 Lab. (1) VI-IX T; 210C
 (2) VI-IX Th; 210C
- *12f,s,su-13f,w—Qualitative Chemical Analysis. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibria, oxidation and reduction, etc. 5 cred. per qtr.; prereq., 8 or 10. Messrs. Sneed, Heisig, and Maynard.
 12f Lect. I TThS; 225C
 Lab. I-III MW; 290C
 12s Lect. II MWF; 100C
 Lab. I-III ThS; 290C
 13f Lect. VI WF; 325C
 Lab. VII-IX WF, VI-VIII M; 290C
 13w Lect. VI WF; 325C
 Lab. VII-IX MWF; 290C
- 14f,su-15w—General Inorganic Chemistry. (Engrs., miners, pharm., and phys. ed.)
 14. Includes a study of the general laws of chemistry and of the non-metals,

* Course 12f may be taken by students registered in the College of Engineering and Architecture in place of 16s.

the metals, and their compounds. 15. Continuation of Course 14. 5 cred. per qtr.; no prereq. Messrs. Barber and Stephens.

(Engrs.)

Lect. II TThS; 100C

Quiz VIII F; 100C

14f Lab. (1) II-IV MW; 110C

(2) VII-IX TTh; 110C

15w Lab. (1) VII-IX T; VI-VIII Th; 110C

(2) II-IV MW; 110C

(Miners)

Lect. II TThS; 100C

Lab. VII-IX TTh; 110C

(Pharm., phys. ed.)

Lect. I MWF; 225C

Lab. VI-VIII TTh; 290C

16s—Qualitative Chemical Analysis. (Engrs., miners, and pharm.) Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibria, oxidation and reduction, and other subjects pertinent to qualitative analysis. 5 cred.; prereq., 5 or 15. Messrs. Reyerson, Barber, Heisig, and Maynard.

(Engrs. who entered with h.s. chem.)

Lect. (1) I TThS; 100C

Lab. (1) VII-IX M, II-IV S;
110C

(2) IV T; 225C; VI Th, IV S; 100C

(2) VI-VIII WF; 110C

(3) I TThS; 100C

(3) I-III WF; 110C

(Engrs. who entered without h.s. chem.)

Lect. (4) II TThS; 100C

Lab. (4) I-III WF; 110C

(5) II TThS; 100C

(5) VII-IX TTh; 110C

(Miners)

Lect. II TThS; 100C

Lab. VII-IX TTh; 110C

(Pharm.)

Lect. I MWF; 225C

Lab. VI-VIII TTh; 290C

17s,su—Glassblowing. Exercises in the more important operations in building chemical apparatus. 1 cred.; no prereq. Mr. Stephens.

51f,w,s,su—Junior Review Examination in General Inorganic Chemistry. Required of juniors in the School of Chemistry. Prereq., Anal. Chem. 1, 2. Mr. Sneed.

52f,w,s,su—Junior Review Examination in Qualitative Analysis. Required of juniors in the School of Chemistry. Prereq., Anal. Chem. 1, 2. Mr. Sneed.

96f-97w-98s—Senior Thesis. 5 cred. per qtr.; sr.

101s—History of Chemistry. Historical development of the theories of chemistry from the period of the ancients to the present time is covered by this course, particular emphasis being given to modern theories and laws. 2 cred.; prereq., Org. Chem. 52. Miss Cohen.

102w,su—Advanced Qualitative Analysis. This course includes an analysis of minerals, alloys, paints, and the methods of detecting some of the rarer elements. 2 or 3 cred.; prereq., Anal. Chem. 1, 2; hrs. ar.; 290C. Mr. Sneed.

103f-104w-105s—Advanced Inorganic Chemistry. Discussion of the periodic system and the chemistry of the elements and their compounds and of special subjects of inorganic chemistry such as valency, oxidation and reduction, complex ions, etc. 3 cred. per qtr.; prereq., Anal. Chem. 1, 2; Org. Chem. 52; I MWF; 215C. Mr. Sneed.

106f-107w-108s—Theories of Inorganic Chemistry. Theory of valency, electron conception and octet theory of G. N. Lewis, geometrical aspects, co-ordination

- theory, and modern theories of chemical combination. 3 cred. per qtr.; pre-req., Phys. Chem. 103 or by permission. Mr. Glockler.
- 109w-110s—Synthetic Inorganic Chemistry. 3 to 5 cred.; prereq., 13. Mr. Heisig. (Not offered in 1932-33.)
- 134f-135w-136s—Seminar: Modern Problems in Inorganic Chemistry. 1 cred.; prereq., Anal. Chem. 1 and 2 and Phys. Chem. 103. Mr. Sneed.
- 301f,su-302w-303s—Research in Inorganic Chemistry. Cred. ar. Messrs. Sneed, Reyerson, and Glockler.

ANALYTICAL CHEMISTRY

(A fee of \$2 per quarter is charged for Courses 1 to 9, inclusive.)

- 1w,su-2s,su—Quantitative Analysis. Introductory courses covering the general principles and methods of quantitative analysis. Typical problems are assigned and attention given to proper laboratory practice. Course 1, Gravimetric Analysis. Course 2, Volumetric Analysis. 5 cred. per qtr.; prereq., Inorg. Chem. 13. Mr. Geiger.

Lect. VI M; 325C

Quiz VI F; 410C

Rec. (1) VI W; 111C

(3) VIII W; 111C

(2) VII W; 111C

Lab. (1) VI-IX MF, VII-IX W; 310C

(3) VI-IX MF, VI-VII, IX W; 310C

(2) VI-IX MF, VI, VIII-

IX W; 310C

- 7f,s,su—Quantitative Analysis. (Pre-med.) Introductory course covering the general principles and methods of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention is given to proper laboratory practice. 4 cred.; prereq., Inorg. Chem. 11 or 13. Messrs. Geiger and Sarver.

7f Lect. (1, 2) VI M; 325C

(3) VII T; 325C

Rec. (1) VI W; 215C (Limit 35)

(3) VI Th; 325C

(2) VI F; 315C (Limit 35)

Lab. (1) VII-IX MW, VI-VII F; 310C

(3) VIII-IX T, VII-IX Th,

(2) VII-IX MF, VI-VII W; 310C

I-III or II-IV S; 310C

7s Lect. VI Th; 325C

Rec. VII Th; 325C

Lab. VII-IX T, VIII-IX Th, I-III or II-IV S; 310C

- 9w—Quantitative Analysis. (Dentists, engineers, miners.) Short introductory course covering general principles of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention given to proper laboratory practice. 3 cred.; prereq., Inorg. Chem. 11 or 16. Mr. Sarver.

Lect. VII Th; 325C

Lab. VI-IX T, VIII-IX Th; 310C

- 53f,w,s,su—Junior Review Examination in Quantitative Analysis. Required of juniors in the School of Chemistry. Prereq., 1, 2. Mr. Geiger.

- 96f,su-97w-98s—Senior Thesis. 5 cred. per qtr.; sr. Messrs. Kolthoff, Geiger, Sarver, and Sandell.

- 101w-102s—Quantitative Analysis. Discussion of the general principles, methods, and procedure of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention is given to proper laboratory practice. 5 cred. per qtr.; prereq., Inorg. Chem. 13. VI-IX MWF; 325, 310C. Mr. Geiger.

- 103w—Exact Gas Analysis. 1 or 2 cred.; prereq., 1, 2. Mr. Sandell.

- 104s—Microchemistry. The properties and identification of crystals under the microscope, qualitative and quantitative microchemistry, inorganic, organic, and applied fields. 3 cred.; prereq., 1, 2. Mr. Sandell.
- 107f,w,s,su—General Technical Analysis. Includes any one of several of such topics as textiles and paper, paint and varnishes, asphalt and tars, boiler waters, soaps, edible oils and fats, and various other food materials and food products depending on the number of credits. Mr. Sandell.
- 110f-111w-112s—Food Analysis. Course including the chemical analysis of the various food materials and food products and the detection of food adulterations. Course in methods of analysis. 3 cred. per qtr.; prereq., 1, 2. Mr. Sandell.
- Lect. IV T; 325C
- Lab. VI-VIII TF; 217C
- 123f,su-124w,su-125s—Advanced Analytical Chemistry. Systematic survey by general lectures with typical procedures selected for laboratory practice. Drill in application of modern chemical theory to analytical problems. 1 lect., 7 lab. hrs. per week; 3 cred.; prereq., 1, 2, or by permission. Mr. Sarver.
- Lect. VI T; 315C
- Lab. VII-IX T, VI-IX Th; 310C
- 130f—Chemistry of Foods. Course in the origin, composition, and manufacture of foods. Systems of food inspection, legal food standards, and adulteration. Lectures and recitations. 3 cred.; jr., sr.; ar. Mr. Sandell.
- 131f—Applications of Indicators in Neutralization Reactions and p_h Determinations. 3 cred.; prereq., 1, 2 and Phys. Chem. 103; VI MW; 215C; lab. hrs. ar. Mr. Kolthoff.
- 132w-133s—Electrometric Measurements and Titrations. Application of potentiometric and conductometric methods in analytical work. 3 cred. per qtr.; prereq., 1, 2, and Phys. Chem. 103. Mr. Kolthoff.
- Lect. VI MW; 315C
- Lab. ar.
- 140w—Water Analysis. Analysis of potable water with interpretation of results. 2 cred.; prereq., 1, 2. Mr. Sandell.
- 201f-202w-203s—Selected Topics in Analytical Chemistry. 3 cred.; prereq., 1, 2, and 123. Mr. Kolthoff.
- 301f,su-302w-303s—Research in Quantitative Analysis. Cred. ar. Messrs. Kolthoff, Geiger, and Sarver.

ORGANIC CHEMISTRY

- 1f,w,su-2w,s,su—Elementary Organic Chemistry. (Pre-med., pre-dent., pharm.) Discussion of important classes of organic compounds, both aliphatic and aromatic. Laboratory work includes the preparation of typical substances. 4 cred. per qtr.; prereq., Inorg. Chem. 11. Messrs. Bartlett and Koelsch.
- 1f-2w Lect. I MWF; 100C
Lab. Conference II Th; 225C
Quiz I Th; ar
Lab. (1) I-IV T; 390C
(2) VI-IX T; 390C
(3) VI-IX W; 390C
- 1w-2s Lect. IV MWF; 100C
Lab. Conference IV T; 100C
Quiz V T; ar
Lab. (1) VI-IX W; 390 (limit 40)
(2) VI-IX Th; 390C (limit 40)
(3) I-IV S; 390C

- 51f-52w-53s—Elementary Organic Chemistry. (All except pre-med., pre-dent., pharm.) Discussion of important classes of organic compounds, both aliphatic and aromatic. Laboratory work includes the preparation of typical substances. 5 cred. per qtr.; prereq., 15 cred. in chemistry. Messrs. Smith and Lauer.
- Lect. III MWF; 325C
 Lab. Conference (f,w) III S; 100C (s) III Th; 100C
 Quiz (f,w) II S; ar.
 Lab. (1) (f,w) M VI-IX; 390C
 (2) T II-V; 390C
 (3) T VI-IX; 390C
 (4) W VI-IX; 390C
 (5) Th VI-IX; 390C
 (6) F VI-IX; 390C
- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; sr. May be taken under any member of the Organic Division.
- 105f-106w-107s—Advanced Organic Chemistry. An advanced, descriptive course covering the field of organic chemistry, together with an introduction to the literature of organic chemistry. May be accompanied by appropriate laboratory work in Organic Chemistry 139. 3 cred. per qtr.; prereq., 53 or equiv.; III TThS; 325C. Mr. Smith.
- 110f—Organic Qualitative Analysis. Reactions of typical functional groups, identification of pure organic compounds, separation and identification of constituents of mixtures. 5 cred.; prereq., 53 or equiv.; lect. IV TS; 315C; 9 hrs. of lab. work ar. Mr. Koelsch.
- 120w—Semi-micro Technique. Manipulation of small amounts of material. Preparations, purifications, preparation of derivatives, fractional distillations and crystallizations. 3 cred.; prereq., Organic 53, Analytical 1 and 2; ar. One lecture and 6 hrs. of lab. work per week. Mr. Lauer.
- 130s—Organic Quantitative Analysis. Methods of proximate and ultimate analysis of organic compounds, with special attention to semi-micro methods. 2 or 3 cred.; prereq., Organic 53 and Analytical 1 and 2; ar. One lecture and 3 or 6 hours lab. work per week. Mr. Lauer.
- 139f,w,s—Advanced Organic Chemistry Laboratory Work. Selected laboratory problems of an advanced nature, including some original work. Students may also register for this course who desire appropriate laboratory work for other advanced courses. 2 to 5 cred.; prereq., 53. Mr. Bartlett.
- 201f-202w-203s—Organic Chemistry Seminar. 1 hr. per week, 1 cred. Required of all students taking research in organic chemistry. Messrs. Smith, Lauer, Bartlett, and Koelsch.
- 205f-206w-207s—Theoretical Organic Chemistry. Structure, reaction mechanisms, relation of physical properties to constitution, and other topics of a theoretical nature. 3 cred. per qtr.; prereq., 107; IV MWF; 315C. Mr. Lauer.
- 211s—Reagents in Organic Chemistry. Discussion of typical reagents used in organic reactions: their limits of applicability, methods of use, and types of substances with which they react. 4 cred.; prereq., 107 and 110; II TThS; 315C. Mr. Bartlett.
- 301f-302w-303s—Research in Organic Chemistry. Cred. ar. Messrs. Smith, Lauer, and Stephens.

PHYSICAL CHEMISTRY

- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; ar.
- 101f-102w-103s—Physical Chemistry. A general survey of the subject. 3 lect. and 1 rec.; lab. work 3 to 6 hrs. per week; 3, 4, or 5 cred., depending on the amount of lab. work; prereq., two years' college chemistry, one year college physics. Messrs. MacDougall and Livingston.
Lect. IV MWF; 325C
Rec. (1) (Chem.) IV S; 325C (f,w), 410C(s) (2) (others) IV S; 325C
Lab. (1) (Chem.) VI-VIII MW; 190C (2) (others) VI-VIII F; 190C
- 105w—Application of Higher Mathematics to Chemical Problems. 3 lect.; 3 cred.; prereq., integral calculus and permission of the instructor. Mr. MacDougall.
- 110f—Physical Chemistry. (For medical students.) 3 cred.; IV MWF; 100C. Mr. Taylor.
- 116f-117w-118s—Advanced Physical Chemistry. 3 lect. and 1 rec.; lab. work for one 3-hour period may be taken if desired; 3 cred. per qtr. or 4 with lab.; prereq., 103 and calculus. Mr. Taylor.
- 128f-129w-130s—Colloid Chemistry. 2 cred. per qtr.; prereq., 103. Mr. Reyerson.
- 131f-132w-133s—Colloid Chemistry Laboratory. Cred. and hrs. ar. Must be preceded or accompanied by 128, 129, or 130. Mr. Reyerson.
- 144s—Chemistry of the Solid State. Methods and results of crystal structure investigation. Correlation of physical and chemical properties of crystals with their internal structure. Lectures and reports. Opportunity offered to do practical work with X-ray equipment. 3 cred.; prereq., 102; hrs. ar.; 103 must be taken simultaneously. Mr. Taylor.
- 161f-162w—Radioactivity. Discovery; theory of atomic disintegration; properties, transformations, and preparation of radioactive elements; properties and effects of alpha, beta, and gamma rays; radioactive and non-radioactive isotopes. 2 cred. per qtr.; prereq., 103. Mr. Lind.
161f IV T, I Th; 115C
162w Ar; C
- 164f,w,s—Radioactivity Laboratory. Use and standardization of electroscopes, radioactive measurements, and quantitative determination of radium in ores, minerals, waters, and plant products. 1 or 2 cred. Must be preceded or accompanied by 161. Mr. Lind.
- 175s—Photochemistry. History, development, and present status of photochemistry. 3 cred.; prereq., optics and 103. Mr. Lind.
- 201f-202w-203s—Thermodynamics and Chemistry. A detailed study of the principles of thermodynamics and their application to physical and chemical phenomena. 4 cred. per qtr.; prereq., 103 and calculus. (Not offered in 1932-33.)
- 204f-205w-206s—Kinetic Theory and Atomistics. Kinetic theory of gases and liquids, crystal structure, structure of atom, quantum theory. 4 cred. per qtr.; prereq., 103 and calculus; II TThS; 115C. Mr. MacDougall.

- 211f-212w-213s—Advanced Physical Chemistry Laboratory. To accompany or follow any of the advanced courses in physical chemistry. Cred. ar.; prereq., 103. Mr. MacDougall.
- 251f-252w-253s—Physical Chemistry Seminar. 1 hr. a week. For students taking advanced courses in physical chemistry. 1 cred. per qtr. Mr. MacDougall.
- 271f-272w-273s—Chemical Activation. (Seminar 1 hour per week for graduate students.) Current theories of chemical activation, including photochemical excitation, gaseous ionization, and the kinetics of cluster and of chain reactions. 1 cred. per qtr.; prereq., physics and physical chemistry. Mr. Lind.
- 301f,su-302w-303s—Research in Physical Chemistry, including work in electrochemistry, photo- and radio-chemistry, and colloids. Cred. ar. Messrs. Lind, MacDougall, Reyerson, Glockler, and Taylor.

CHEMICAL ENGINEERING

- 1f,w,s,su—Power Plant Chemistry. (M.E.) Proximate analysis of coal, determination of calorific power; technical analysis of flue gases and furnace gases. 3 cred.; prereq., Inorg. Chem. 16. Mr. Stoppel.
- 1f Lect. II T; 215C
Rec. II Th; 215C
Lab. (1) I-III MF; 10C
- 1w Lect. III T; 215C
Rec. III Th; 215C
Lab. II-IV MF; 10C
- 1s Lect. I M; 115C
Rec. I F; 115C
Lab. VI-VIII TTh; 10C
- 2w,s—Boiler Water. (Engineers and miners.) 2 or 3 cred.; prereq., 1 or Anal. Chem. 9 or by permission. Mr. Stoppel.
- 2w Lect. I T; 215C
Lab. VI-IX TTh; 10C
- 2s Lect. IV M; 215C
Lab. ar
- 31s—Chemistry of Engineering Materials. Application of general chemistry to engineering practice. Consideration of the chemistry and properties of wood, iron and steel, alloys, fuels, water, cements, paints, bitumens, etc. Lectures and recitations. 3 cred.; prereq., Inorg. Chem. 16. For engineers. IV MWF; 115C. Mr. Montonna.
- 41s—Gas Manufacture and Distribution. Fundamental principles of manufacture of coal gas, carbureted water gas, and other industrial fuel gases, and the apparatus for manufacture and distribution. Open to sophomores in the College of Engineering and Architecture who have completed one year of chemistry. Lectures and recitations. 3 cred. Mr. Montillon.
- 76f-77w—Applied Electrochemistry. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and electrochemical products. Open to engineers who have had one year of chemistry and one year of physics. Class and laboratory work. 3 cred. Mr. Ruth.
- 80s—Chemical Engineering Materials. The technology, physical and chemical properties, and economic considerations of materials used in the construction

- of chemical engineering equipment and plants. Ferrous and non-ferrous metals and alloys, woods, brick, concrete and ceramic materials, textiles, rubber, protective materials, etc. 1 cred.; prereq., Inorg. Chem. 13; II TS; 325C. Mr. Mann.
- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; sr.
- 101f,su—Unit Processes. Principles and materials of construction, operation, and uses of machinery for the unit processes. Lectures and recitations. Visits to chemical plants. 3 cred.; prereq., 80, Anal. Chem. 1, 2; I MTWFS; 325C. Mr. Mann.
- 102s,su—Unit Process Problems. Problems in combustion, furnaces, and kilns, the application of industrial heating and cooling devices, the study of crystallization on a commercial scale. 3 cred.; prereq., 101. Messrs. Montillon, Ruth, and Hovde.
- (1) II MWF; 325C (2) II MWF 111C
- 103f—Unit Process Problems. Problems in heat transfer, the use and design of heat exchangers, single and multiple effect evaporators, the applications of the laws of fluid, filtration, filter presses, and centrifugals. 3 cred.; prereq., 101. Messrs. Montillon, Ruth, and Hovde.
- (1) II MWF; 325C (2) II MWF; 410C
- 104w—Unit Process Problems. Problems in leaching and dissolving, counter-current extraction, gas absorption, and distillation. Drying by air, steam, and direct heat dryers. 3 cred.; prereq., 101. Messrs. Montillon, Ruth, and Hovde.
- (1) II MWF; 325C (2) II MWF; 410C
- 105f,su—Gas and Fuel Analysis. The chemical analysis of solid gaseous fuels with a determination of their calorific value and methods of testing municipal gas. 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Stoppel.
- Lect. I Th; 225C
 Rec. (1) IV S; 215C (2) IV T; 215C
 Lab. (1) VI-IX M; 10C (4) VI-IX W; 10C
 (2) II-V T; 10C (5) VI-IX Th; 10C
 (3) VI-IX T; 10C (6) VI-IX F; 10C
- 106w—Petroleum and Petroleum Products. Examination and testing of petroleum products, principally gasoline, illuminating and lubricating oils. 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Stoppel.
- Lect. I Th; 225C
 Rec. (1) IV S; 215C (2) IV T; 215C
 Lab. (1) VI-IX M; 10C (4) VI-IX W; 10C
 (2) II-V T; 10C (5) VI-IX Th; 10C
 (3) VI-IX T; 10C (6) VI-IX F; 10C
- 110s—Special Analytical Apparatus. Problems in the use of refractometers, saccharimeters, and calorimeters. 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Stoppel.
- Lect. III Th; 215C Lab. VI-VIII MW; 10C
- 111f-112w-113s—Design of Chemical Engineering Equipment and Plants. Laying out of plants and design of equipment based on collected data for the same. Classroom and laboratory work. 2 cred. per qtr.; prereq., Chem. Eng. 104. Mr. Montillon.

- 117s—Chemical Engineering Equipment Design. Fundamental principles in the design of simple chemical engineering equipment. Laboratory work. 3 cred.; prereq., Chem. E. 104. Messrs. Montonna and Hovde.
Lect. IV T; 410C
Lab. (1) VI-IX TTh; 410C (2) VI-IX TTh; 443C
- 121w—Chemical Engineering Economics. The economic and business considerations controlling chemical engineering industries. Statistical analysis of the characteristics of these industries. Raw and finished products. Principles of plant location, layout, and design. Unit operation costs. Principles of management operation and control. Lectures and recitations. 3 cred.; prereq., Chem. Eng. 132; III MWF; 111C. Mr. Montonna.
- 131w—Industrial Inorganic Chemistry. Operations common to chemical industries, chemistry involved, apparatus used, marketing of products, utilization of by-products, use of trade journals. Topics: acids and alkalies, salts, chlorine, ammonia, glass, pigments, etc. Lectures and recitations. 4 cred.; (for chem. engrg.); prereq., 101; I MTWFS; 325C. Mr. Mann.
- 132s—Industrial Organic Chemistry. Similar to 131 but covering organic field. Destructive distillation of coal and wood, petroleum oils, paper, unit organic processes, vegetable and animal oils, fats, waxes, soap, sugar, starch, etc. Lectures and recitations. 4 cred.; (for chem. engrg.); prereq., 101; I MTWThF; 325C. Mr. Mann.
- 133f—Chemistry of Explosives. History and development of modern explosives, their manufacture and uses. Lectures, required reading, and reports. 3 cred.; prereq., 132; I MWF; 115C. Mr. Montonna.
- 134f—Intermediates and Dyestuffs. Their technical chemistry and manufacture. Processes, purification, uses, etc. Lectures and recitations. 3 cred.; prereq., 132 or equiv. (may be accompanied by laboratory work in 160); I TThS; 111C. Mr. Montonna.
- 136w—Chemistry and Technology of Cellulose. Discussions on processes and industries based on the use of cellulosic materials including the chemical and technological considerations. Pulp and paper, plastics, esters, artificial silks, etc. Lectures and recitations. 3 cred.; prereq., Org. Chem. 52 or equiv.; I TThS; 111C. Mr. Montonna.
- 140w—Sanitary Chemistry. Discussion of the chemistry of sewage and potable waters. Purification of water supplies, and the treatment of municipal and industrial wastes. May be accompanied by appropriate laboratory work in Chem. E. 107-108-109. Lectures and recitations. 3 cred.; jr., sr.; ar. prereq., Bact. 41 or by permission. Mr. Stoppel.
- 141s—Gas Manufacture and Distribution. Fundamental principles of manufacture of coal gas, carbureted water gas, and other industrial fuel gases, and the apparatus for manufacture and distribution. Open to chemists and chemical engineers. 3 cred.; prereq., Org. Chem. 52. Mr. Montillon.
- 150s—Unit Process Laboratory. Operation and testing of chemical engineering equipment. Laboratory work and reports. 1 cred.; prereq., Chem. Eng. 101. Mr. Ruth.
Lab. (1) VI-VIII M; 90C (3) I-III S; 90C
(2) VI-VIII W; 90C (4) Arranged

- 151f,su*—Chemical Manufacture (Inorganic). Manufacture of technical products on a scale large enough to afford data for the determination of costs of manufacture. Use of semiplant scale equipment. Technical trade journals used. Laboratory. 3 or more cred.; prereq., 101. Messrs. Montonna and Hovde.
- 152w,su*—Chemical Manufacture (Organic). Similar to 151 but covering the organic field. Laboratory. 3 or more cred.; prereq., 101. Messrs. Montonna and Hovde.
- 153f-154w-155s-156su—Special Laboratory Problems. Laboratory investigations on equipment and the manufacture of special chemical products on a large scale. 3 or more cred. Messrs. Mann, Montillon, and Montonna.
- 160f—Intermediates and Dyestuffs Laboratory. Manufacture of intermediates and dyestuffs on a large scale using semi-works equipment. Operations on sulphonation, hydroxylation, nitration, reduction, alkylation, diazotization, coupling, etc. Laboratory. 3 or more cred.; prereq., 132, 152 and preceded or accompanied by 134. Mr. Montonna.
- 168w—Petroleum and Petroleum Products. (Miners.) 3 cred.; prereq., Anal. Chem. 9. Mr. Stoppel.
Lect. I M; 115C
Rec. I W; 115C
Lab. VI-IX W; 10C
- 176f-177w—Applied Electrochemistry. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and electrochemical products. Class and laboratory work. 4 cred. per qtr.; prereq., Phys. Chem. 103. Mr. Montillon.
Lect. I MWF; 111C
Lab. VI-VIII W or Th; 25C
- 179s—Applied Electro-Organic Chemistry. Theory and practice of the electrochemistry of organic compounds. Lect. and rec., lab. 1 or 2 cred. optional. 3 cred.; prereq., 176-177; III MWF; 115C. Mr. Mann.
- 187s—Inspection Trip. Various industrial plants in the middle west are visited by the class on a trip which lasts about ten days, during the spring vacation period. Written reports covering the plants must be submitted. Required of seniors in Chemical Engineering. 2 cred.; prereq., 131, 132. Mr. Mann.
- 201f-202w-203s—Seminar. Presentation and discussion of papers concerning the newer developments in chemical industries. 1 cred. per qtr. Mr. Mann.
- 301f,su-302w-303s—Research in Chemical Engineering. Unit processes, applied electrochemistry and electric furnace work, and chemical manufacture. Cred. ar. Messrs. Mann, Montillon, Montonna, Stoppel, and Ruth.

CIVIL ENGINEERING

SURVEYING

- 9f—Surveying. Principles of transit and stadia surveying and leveling; field problems, computation and platting of traverses, adjustment of instruments. Open to students in Geology. 3 cred.; prereq., Math. 6; VI-IX WF; 101E. Mr. Cutler.

* Required for chemical engineers during Summer Session.

- 10s—Surveying. Triangulation, stadia and plane table surveys, computation and platting of topographic surveys. Open to students in Geology. 3 cred.; prereq., 9; VI-IX WF; 7E. Mr. Zelner.
- 11f—Surveying. Field problems; use of chain, compass, transit. Computation and platting of field surveys. Determination of areas. 3 cred.; prereq., M.&M. 12, Dr. 2 or Arch. 23. Mr. Boon.
Lect. III Th; 21E
Lab. (1) II-IV T, VI-IX Th; 1E (3) VI-VIII W, VI-IX F; 1E
(2) VI-IX T, II-IV S; 1E
- 12w—Surveying. Lectures and drawing room. Platting of maps, profiles, and cross sections. Computation of earthwork. Public land surveys. Conventional signs. 3 cred.; prereq., 11. Messrs. Cutler, Zelner, and Boon.
Lect. (1) VII T; 21E (2) III W; 21E
Lab. (1) II-IV T, VII-VIII T, VI-VII F; 217E (3) VI-IX W, VI-VIII Th; 217E
(2) VII-IX M, III-IV W, VIII-IX F; 217E
- 13s—Surveying. Adjustments of instruments, profile and differential leveling, circular curves. 3 cred.; prereq., 12. Messrs. Cutler and Boon.
Lect. III Th; 21E
Lab. (1) II-V T, II-IV S; 21E
(2) VII-IX W, I-IV S; 5E
(3) VI-IX W, VI-VIII Th; 21E
- 14f—Surveying. Complete topographical survey, stadia method, is made and plotted. 3 cred.; prereq., 13. Mr. Zelner.
(1) VI-IX TW; 229E (3) VI-IX M, I-IV T; 217E
(2) VI-IX F, I-IV S; 217E
- 15w—Surveying. Purpose and theory of triangulation, meridian determination, base line measurements, computations. Theory and use of the sextant. Hydrographic surveying. Aerial mapping. Applied problems. 2 cred.; prereq., 14. Mr. Zelner.
(1) VI T, III ThFS; 21E (2) VI M, II TThF; 21E
- 16s—Surveying. Classroom and field. Field problems with the sextant. Triangulation reading and computations. Plane table theory. Various field solutions of the "three point" problem. Plane table survey based on triangulation control. Topographic map. 2 cred.; prereq., 15. Mr. Zelner.
(1) III-IV T, VI-IX M; 21E (2) I-II F; 21E; I-IV S; 7E
- 17s—Surveying. (Aero. E.) Short course in the use, care, and adjustment of surveying instruments, including leveling, transit and topographic surveys. 3 cred.; prereq., M.&M. 12, Dr. 2. Mr. Boon.
Lect. I W; 21E
Lab. (1) VI-IX T; 21E, I-III Th; 22E
(2) I-IV M; 21E, II-IV W; 7E
- 18s—Surveying. Short course in the use, care, and adjustment of surveying instruments. Leveling and transit surveys. Open to junior and senior engineers. 3 cred.; VI-IX TTh; 7E. Messrs. Cutler and Brinker.
- 19f,s—Surveying. (M.E.) Short course including problems in chaining, transit and tape surveys; differential, trigonometric and profile leveling, computations and platting of notes, etc. 3 cred.; prereq., M.&M. 12. Mr. Brinker.
19f Lect. III F; 21E Lab. I-III M, I-IV W; 217E
19s Lect. I F; 22E Lab. VI-IX M, VI-VIII T; 22E

23su—Summer Camp. Six weeks immediately preceding the beginning of the senior year. Extended railroad, topographic, hydrographic, and triangulation surveys. 9 cred.; prereq., 16, 22. Fee, \$25. Messrs. Cutler, Zelner, Boon, and Brinker.

RAILWAY ENGINEERING

21w—Railway Engineering. General survey of the problems of railway location, including grades, curvature, rise and fall, etc. 2 cred.; prereq., 14. Mr. Boon.

Lect. I Th; 205E

Lab. (1) VI-IX F; 229E

(2) I-IV T; 229E

(3) I-IV S; 229E

22s—Railway Engineering. Study of the construction and maintenance of railway track and structures. Simple, compound, and spiral curves, and turnouts. 2 cred.; prereq., 21. Messrs. Cutler and Boon.

Lect. VI W; 22E

Lab. (1) VI-IX F; 229E

(2) VI-IX M; 229E

121f—Railway Engineering. Train resistance, ruling and momentum grades, curvature, distance, rise and fall as factors in location and operation of railroads. Train loading, acceleration, retardation; locomotives and equipment. Operating costs governing grade revision. 3 cred.; prereq., 23. Mr. Cutler.

Lect. III F; 21E

Lab. (1) II-IV TW; 227E

(2) VI-VIII T, I-III Th; 217E

122w—Railway Engineering. Lectures, office work, and field inspection. Design and operation of various types of yards and terminals, and terminal facilities, including the hump, engine house, coal and water station. Signaling and interlocking. 3 cred.; prereq., 23. Mr. Cutler.

123s—Railway Engineering. Design and construction of railroad buildings and structures; culverts, wooden trestles, switches, cross-overs, crossing frogs, etc. Earthwork computation, estimates and reports. Distribution of material by mass diagram. 3 cred.; prereq., 23. Mr. Cutler.

124w—Transportation. Development of railway and inland waterway transport, railway regulation and control with special reference to the 1920 Railway Transportation Act, geographical, financial, and rate grouping of railways, Interstate Commerce Commission method of accounting, cost and value of service, present systems, and organization. 3 cred.; prereq., 121; IV MW, II S; 21E. Mr. Cutler.

125s—Transportation. Specific illustrative problems: Twin City and Mississippi Valley traffic situation, Mississippi River experiment, New York Barge Canal, Great Lakes traffic, Panama Canal status. 3 cred.; prereq., 121. Mr. Cutler.

221f-222w-223s—Railway Administration. Analysis of railway organization and methods of management and operation. Special problems. 3 cred. per. qtr.; prereq., 122. Mr. Cutler.

224f—Railway Terminals and Yards. Continuation of Course 123. 3 cred.; prereq., 122. Mr. Cutler.

STRUCTURAL ENGINEERING

- 31f—Stresses in Structures. Algebraic and graphic analysis of various types of bridge trusses for fixed and moving loads. 2 cred.; prereq., M.&M. 26. Mr. Parcel.
Lect. II Th; 21E
Lab. (1) VIII-IX Th; 201E (2) VIII-IX F; 229E
- 32w—Stresses in Structures. Analysis of simple span bridge trusses. Standard engine loadings and equivalent uniform loads. Laboratory tests of structural members. 3 cred.; prereq., 31, M.&M. 141. Messrs. Parcel, C. A. Hughes, and Brinker.
Lect. II W; 21E
Lab. (1) II-III M; 101E; I S; 215Ex; II S; Ex
(2) II-III M; 101E; VII Th; 110Ex; VIII Th; Ex
- 33s—Elementary Structural Design. Designing principles and methods. Complete design and detail drawing of framed mill building bent and railway plate girders. Laboratory tests of structural members and connections. 4 cred.; prereq., 32, M.&M. 128, Dr. 23. Messrs. Parcel and C. A. Hughes.
Lect. VI Th; 22E
Lab. (1) VIII-IX WTh; 201E; III M; 110Ex; IV M; Ex
(2) VIII-IX WTh; 201E; VI F; 110Ex; VII F; Ex
- 35w—Analysis of Buildings. (Arch.E.) Moments and stresses in building girders and frames under various conditions of loading. Building codes requirements. Laboratory tests of structural members, frames and connections. 3 cred.; prereq., 31, M.&M. 141. Messrs. Parcel, C. A. Hughes, and Brinker.
Lect. II F; 206E Lab. II-III M; 101E, I-II S; Ex
- 36s—Design of Steel Frame Buildings. Beams and girders, columns and built-up sections. Design of a typical steel building frame. Laboratory tests of structural members and connections. 4 cred.; prereq., 35. Messrs. Parcel and C. A. Hughes.
Lect. I W; 22E Lab. VII-IX Th; 217E; III-IV M; Ex
- 37s—Structural Engineering. (Ag.E., M.E., E.E.) Analysis of stresses in simple structural frames. Roof trusses, crane girders, mill building bent. 3 cred.; prereq., M.&M. 26 or 84. Mr. Wise.
Lect. VI Th; 107E Lab. VI-IX T, VII-IX Th; 229E
- 38f—Stresses in Structures. (Arch.) Application of laws of equilibrium to simple structures. Special emphasis is placed on graphic methods. 3 cred.; prereq., M.&M. 93; I TThF; 215E. Mr. C. A. Hughes.
- 39w—Structural Design. (Arch.) General principles of structural design. Girders, columns, and roof trusses. 3 cred.; prereq., 38; I TThS; 206E. Mr. C. A. Hughes.
- 41s—Reinforced Concrete. (Arch.) Brief course in theory and designing methods with special reference to building. 3 cred.; prereq., M.&M. 93; I TThS; 215E. Mr. C. A. Hughes.
- 131w,su—Bridge Analysis. Stresses in Simple span bridges of the larger type and in cantilevers, arches, and continuous bridges. 3 cred.; prereq., 134; VII M; 215E; VI-VII F; 227E. Messrs. Parcel and Brinker.
- 132s,su—Bridge Design. Design and detail drawing of railway pin connected truss span. 3 cred.; prereq., 131; VI T; 215E; III-IV, VI-IX M; 227E. Mr. Parcel.

- 134f,su—Statically Indeterminate Structures. Theory of deflections and statically indeterminate stresses and their application to continuous girder, frames, swing bridges, and redundant members. 3 cred.; prereq., 33, M.&M. 128. Mr. Parcel.
Lect. VI TF; 205E Lab. I-II S; 227E
- 135s,su—Reinforced Concrete Design. Analysis of structures as rigid frames. Application to reinforced concrete buildings. Effect of temperature and shrinkage. Effect of settlement of foundations. 4 cred.; prereq., 142 or 142a; II-III M, VI-IX F; 217E. Mr. Wise.
- 141f,su—Reinforced Concrete. Principles of reinforced concrete. Theory of beams, slabs, and columns and the application to ordinary structures. 3 cred.; prereq., M.&M. 128. VI-VII M; 227E; VI Th; 205E. Mr. Wise.
- 141(a)f,su—Reinforced Concrete. Similar to 141 with problems of special interest to students in architectural engineering. 3 cred.; prereq., M.&M. 128; VI-VII M, 229E; VI Th; 205E. Mr. Wise.
- 142w,su—Reinforced Concrete Design. Continuation of 141 with especial emphasis on the practical features of the design of buildings, bridges, retaining walls, etc. 3 cred.; prereq., 141; VI M; 22E; VI-VII T; 227E. Mr. Wise.
- 142(a)w,su—Reinforced Concrete Design. Similar to 142 with problems of special interest to students in architectural engineering. 3 cred.; prereq., 141(a); VI M; 22E; VI-VII T; 229E. Mr. Wise.
- 143s—Reinforced Concrete Analysis. Advanced problems in design including reinforced concrete arch. 3 cred.; prereq., 134, 142. Mr. Wise.
- 146f,w,s—Plain Concrete. Theory of design and control of concrete mixtures. Practice in control tests of concrete and concrete materials. Lectures and laboratory work. 3 cred.; prereq., M.&M. 141. Mr. C. A. Hughes.
146f Lect. III MTh; 209Ex Lab. VI-IX W; Ex
146w Lect. II T, III S; 209Ex Lab. VI-IX W; Ex
146s Lect. III WTh; 209Ex Lab. VI-IX Th; Ex
- 147w—Foundations. Design and construction of footings, cofferdams, and caissons for bridges and buildings. Piers and abutments. Underpinning of buildings. Exploration and testing of foundation sites. Excavation and removal of materials from foundation site. 2 cred.; prereq., 33, M.&M. 128; VII W, III S; 215E. Mr. Wise.
- 148f-149w-150s—Advanced Concrete. Short research problems in concrete. 2 cred. per qtr.; prereq., 146; ar. Mr. C. A. Hughes.
- 234f-235w-236s—Advanced Theory of Structures. Application of the theory of indeterminate stresses to the more complex problems of structural analysis. Continuous and swing bridges, simple and multiple arch and suspension systems, wind stresses in tall building frames, secondary stresses. 3 to 5 cred. per qtr.; prereq., 132, 142. Messrs. Parcel and Wise.
- 237f-238w-239s—Structural Laboratory. Experimental problems in structural steel. Strain gauge study of actual stress distribution in beams, columns, and riveted joints. 3 to 5 cred. per qtr.; prereq., 133. Mr. C. A. Hughes.
- 245f-246w-247s—Seminar. Special topics in the higher theory of structures. 3 to 6 cred. per qtr.; prereq., 134, 142. Messrs. Parcel and Wise.

HIGHWAY ENGINEERING

- 51f—Highways and Pavements. Elementary course with field inspection, relating to the economies, location, construction, and maintenance of highways and pavements. 3 cred.; prereq., 12. Mr. Lang.
 Lect. (1) VI MTh; 215Ex (3) VII W, VI F; 215Ex
 (2) VI TW; 215Ex
 Lab. (1) VII-IX M; 215Ex (3) VII-IX Th; 215Ex
 (2) VII-IX T; 215Ex
- 52w—Highways and Pavements. Continuation of Course 51, with laboratory practice. 3 cred.; prereq., 51. Mr. Lang.
 Lect. VI Th; 215Ex
 Lab. (1) VI-IX M, VIII-IX W; 215Ex (3) VI-IX T, VI-VII W; 215Ex
 (2) VII-VIII Th, VI-IX F; 215Ex
- 55f—Public Highways. Historical development, administration and legislation pertaining to highways, also general economic problems of highway improvements. 3 cred.; no prereq.; I MWF; 215Ex. Mr. Lang.
- 154w—Soils Laboratory. Laboratory study of properties of soils which pertain to their stability. 1 cred.; prereq., jr. or sr.; I-III T; 215Ex. Mr. Lang.
- 156w—Highway Transport. Development, economic field, relation to other forms of transportation. Highway transport surveys, economics of location, economics of selection of type of surface, effect of vehicle on road and road on vehicle. 3 cred.; prereq., 52. Mr. Lang.
- 157s—Highway Transport. Motor vehicle as a common carrier, analysis of road legislation, taxation. Principles of successful operation. Selling motor transportation. 3 cred.; prereq., 156. Mr. Lang.
- 251s—Highway Laboratory. Investigations in co-operation with State Highway Department. 3 to 5 cred.; prereq., 52. Mr. Lang.
- 252s—Highway Design. Preparing of a plan and specification for short sections of highway and city streets, also making estimates of materials and cost. 3 to 5 cred.; prereq., 52. Mr. Lang.

HYDRAULIC ENGINEERING

- 161f—Hydrology. Rainfall, evaporation, transpiration, percolation, run-off. Flood and low water of streams. Storage for use in water supply, water power, irrigation and navigation. Mass curves and frequency curves. 3 cred.; open to sr. only. Mr. Bass.
 Lect. II MF; 21E
 Lab. (1) VII-IX T; 227E (2) VII-IX Th; 227E
- 164f,w,s—Water Power. Types of low, medium, and high-head developments. Details of developments. Dams. Turbine settings and characteristics. 3 cred.; prereq., M.&M. 129. Mr. Bass.
 164f Lect. I T; 107E Lab. III-IV M, VI-IX W; 227E
 164w Lect. II M; 21E Lab. VI-IX Th, II-III W; 229E
 164s Lect. II M; 107E Lab. III-IV W, VI-IX F; 227E
- 263s—Hydraulic Engineering Problems. Special hydraulic problems in laboratory, drafting room, and field. 3 to 5 cred.; prereq., 164.

MUNICIPAL AND SANITARY ENGINEERING

- 162f,w—Water Supply and Sewerage. Sources of water supply; quality of water. Methods of testing, collection, distribution, and purification of water. Selection of pumping machinery and motive power. Sewer systems and sewage disposal works. 3 cred.; prereq., M.&M. 129. Mr. Bass.
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| 162f | Lect. III M; 21E | Lab. VIII-IX M, II-III W, VI-VII F; 229E |
| 162w | Lect. III W; 206E | Lab. II-III M, VIII-IX T, VI-VII Th; 227E |
- 163w,s—Water Supply and Sewerage. 3 cred.; prereq., 162. Mr. Bass.
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| 163w | Lect. I WF; 206E | Lab. II-III Th, II-IV F; 217E |
| 163s | Lect. II TTh; 104E | Lab. III-IV F, II-IV S; 227E |
- 171w—Building Sanitation. Location and orientation of buildings; lighting, ventilation, water supply, plumbing, sewage, and refuse disposal. 2 cred.; prereq., sr. arch. only. II WF; 5E. Messrs. Bass and Martenis.
- 261f-262w—Water and Sewage Purification. Design of water purification and sewage disposal works. 3 to 5 cred. per qtr.; prereq., 163. Mr. Bass.

GENERAL

- 53s—Civil Engineering Practice. Greater problems of engineering. Interrelations of various branches of engineering in practice. Legal, financial, and business functions of the engineer. Relations of the engineer to government and public affairs. 3 cred.; open to juniors and seniors. Mr. Bass.
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| (1) I TTh, VII W; 21E | (2) I M; 22E; TTh; 21E |
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- 172s—City Planning. Physical elements of the city; topography, drainage, geology. Public works and structures. Internal and external transportation. Zoning. Subsurface structures. Esthetic features of the city. 3 to 5 cred.; prereq., 52; III MWF; 21E. Messrs. Bass and Mann.
- 280f-281w-282s—Civil Engineering Research. Original work in concrete, structural steel, hydraulics, municipal or transportation problems. Investigations, reports, tests, designs. 5 cred. per qtr.; by permission. Messrs. Bass, Cutler, Lang, and Parcel.

DAIRY HUSBANDRY

- 7f,s—Elements of Dairying. Composition of milk. Causes of variation in composition; milk constituents and their uses in dairy manufacture and as food; Babcock test; sanitary handling of milk and cream on the farm. 3 cred.; no prereq. Mr. Combs. (For Agr.Eng. only.) Students will meet with the lecture section of Dairy Husbandry 1.
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| 7f | III TWS; 100HH(UF) |
| 7s | III TThS; 100HH(UF) |

DRAWING AND DESCRIPTIVE GEOMETRY

- 1f,w,su—Engineering Drawing. Elements of drafting including an introductory course in methods of representation, and constructive geometry. Graphs and formulas. Sketching, lettering, working drawings, conventions, standards, tracing, and blueprinting. 3 cred.; prereq., solid geometry. Messrs. Schuck, Archibald, Potter, Williams, Cruzen, and Quaid.

- 1f (1) VI-VII MTThF; 417C (3) III-IV TS, VIII-IX T, VII-VIII W; 417C
(2) I-II MTThS; 417C
- 1w (1) I-II MTWS; 455C (2) III-IV TS, VIII-IX T, VII-VIII Th; 455C
- 2w,s,su—Engineering Drawing. 3 cred.; prereq., 1. Messrs. Schuck, Archibald, Potter, Williams, Cruzen, and Shultz.
- 2w (1) VI-VII MWF, II-III Th; (3) III-IV TS, VIII-IX T, VII-VIII Th; 417C
417C
(2) I-II MTWS; 417C
- 2s (1) III-IV T, VI-VII MThF; (2) VIII-IX MTF, III-IV S; 455C
455C
- 3f,w,s,su—Descriptive Geometry. Elementary course in the methods of representation, correlated in part with analytical geometry. Graphical and algebraic solutions. Lectures, demonstrations, and drafting. 3 cred.; prereq., 2, M.&M. 11. Messrs. Eggers, Levens, Williams, and Shultz.
- 3f (1) VIII-IX MWF, III-IV S; 201E (3) VI-VII MTThF; 455C
(2) I-II MWF, II-III Th; 101E
- 3w VIII-IX MWThF; 201E
- 3s (1) III-IV T, VI-VII MThF; 417C (3) VIII-IX MTF, III-IV S; 417C
(2) I-II MWThF; 417C
- 4f,su-5w,su-6s,su*—Engineering Drawing and Descriptive Geometry. (Chem. and chem. engr.) 2 cred. per qtr.; prereq., solid geometry. III-IV MWF; 455C. Messrs. Williams, Schuck, and Cruzen.
- 7w,su-8s,su*—Engineering Drawing and Descriptive Geometry. (Chem. and chem. engr.) 3 cred. per qtr.; prereq., solid geometry. Messrs. Eggers and Schuck.
- 7w III-IV MWF, VIII-IX W; 445C
- 8s III-IV MWF, VIII-IX Th; 445C
- 9f,w,s—Drafting. (Chem. engr.) 2 to 6 cred; prereq., 6 or 8. Mr. French.
- 11f—Engineering Drawing (Mines). 4 cred.; no prereq.; III-IV MTWFS; 101E. Messrs. Potter and Archibald.
- 12w—Engineering Drawing (Mines). 2 cred.; prereq., 11; III-IV WF; 445C. Messrs. Potter and Archibald.
- 13s—Engineering Drawing (Mines). 3 cred.; prereq., 12; III-IV TWFS; 1E. Messrs. Potter and Myers.
- 14f—Descriptive Geometry (Mines). Not an engineering elective. 3 cred.; prereq., 13, Mine Math. 5. Messrs. Eggers and Myers.
- (1) I MWF; 3E (2) I MWF; 203E
- 15w—Drafting (Mines). 2 cred.; prereq., 14; III-IV WF; 101E. Messrs. Potter and Archibald.
- 21f,w,s,su—Drafting (C.E.) The application of descriptive geometry to drafting room problems including working drawings. 2 cred.; prereq., 3. Messrs. French, Archibald, Levens, and Myers.
- 21f (1) III-IV MWF; 201E (2) VI-VII MTTh; 101E
- 21w III-IV MFS; 201E
- 21s I-II MWF; 1E
- 22w,s,su—Drafting (C.E.). Detail, assembly, and construction drawings of steel members and simple structures. Standards, conventions, and graphical methods. 2 cred.; prereq., 21. Messrs. French, Archibald, Levens, and Myers.
- 22w (1) III-IV MFS; 1E (2) VI-VII MTF; 1E
- 22s III-IV MWF; 101E

* For permissible substitute, see page 62.

- 23f,s,su—Drafting (C.E.). Drafting problems in general construction work including earth work, wood, steel, and concrete. 2 cred.; soph. C.E.; prereq., 22. Mr. French.
 23f I-II MWF; 201E
 23s (1) III-IV MWF; 201E (2) VI-VII MTF; 101E
- 26w,s,su*—Drafting (E.E.). Applications of descriptive geometry to drafting room problems. Working drawings and tracing. 2 cred.; prereq., 3. Messrs. Eggers, Cruzen, and Quaid.
 26w (1) VIII-IX MWF; 101E (2) VIII-IX TTh, III-IV S; 101E
 26s VIII-IX MWF; 101E
- 23f,w,su*—Drafting (Aero.E.). Application of descriptive geometry to drafting room problems. Working drawings and tracing. 2 cred.; prereq., 3. Messrs. Shultz, Potter, and Williams.
 28f (1) VI-VII MW, II-III Th; 201E (2) VI-VII TThF; 201E
 28w VIII-IX MWF; 1E
- 29w,s,su—Drafting (Aero.E.). Application of elementary formulas in the proportioning of simple machine parts. Detail and assembly drawings. Machine and structural drafting and graphical methods. 2 cred.; prereq., 28. Messrs. Shultz, Potter, and Williams.
 29w VI-VII MWTh; 201E
 29s (1) VI-VII MThF; 201E (2) VIII-IX MTF; 201E
- 34f,w,s—Lettering. Study and analysis of single stroke lettering with particular emphasis on the application to engineering drawing. 1 cred.; prereq., 1. Messrs. Levens, Archibald, and Quaid.
 (1) IV T; 107E (2) II Th; 107E(f,s); 7E(w)
- 37f,w,s—Lettering for Engineers. Analysis of the alphabets. Exercises in roman and gothic lettering. Design and composition of the paragraph and the title. 2 cred.; prereq., 2. Messrs. Archibald and Schuck.
 37f,w I WF; 238EE
 37s I WF; 36EE
- 41f,w,s-42f,w,s-43f,w,s—Technical Drawing. (a) General course in the theory and practice of drawing. Sketching, lettering, tracing, conventions, renderings, and mechanical drawings. (b) Modification of the above course of particular interest to dental and medical students. 2 cred. per qtr.; no prereq. Mr. Kirchner.
 (1) I-II MWF; 411C (3) VIII-IX MWF; 411C
 (2) III-IV MWF; 411C
- 44f,w,s—Lettering. Practical course in plain lettering. Not an engineering and architecture elective. 1 cred.; no prereq. Messrs. Levens, Archibald, and Schuck.
 (1) IV T; 104E(f); 203(w,s) (2) II Th; 104E(f); 206E(w,s)
- 45f,w,s—Alphabets. Construction and analysis of various types of letters and their arrangement. Exercises, and reference work. Not an engineering and architecture elective. 2 cred. per qtr.; soph., jr., sr.; no prereq.; II TTh; 205E. Mr. Kirchner.

* For permissible substitute, see page 62.

50w,s—Diagrams and Charts. Elementary course dealing with the construction of simple diagrams and charts. 2 cred.; no prereq. Messrs. Eggers and Cruzen.

50w I TTh; 22E

50s I T; 22E; I Th; 7E

51f,w—Graphic Representation and Computation. Types of charts and applications to the solution of problems and equations. 3 cred.; prereq., 2, M.&M. 12; III MWF; 7E. Messrs. Eggers and Levens.

52w,s—Alignment Charts or Collinear Nomograms. Straight and curved scales, and diagrams with adjustment. 3 cred.; prereq., 3, M.&M. 13; I MWF; 7E. Messrs. Eggers and Levens

53s—Design of Diagrams for Formulas and Experimental Data. Empirical equations. 3 cred.; prereq., 3, M.&M. 13; IV MWF; 21E. Messrs. Eggers, Levens, and Shultz.

61f,w—Projections. Elementary principles of descriptive geometry and their application to architectural problems of projections and intersections. 2 cred.; no prereq. Messrs. Kirchner and Myers.

61f Lect. III F; 203E

Lab. VII-IX T; 309E

61w* Lect. II T; 206E

Lab. VII-IX M; 309E

62w—Shades and Shadows. Geometrical determination of shades and shadows on architectural forms. 2 cred.; prereq., 61 or registration in 61; III F; 206E, VI-VIII T; 309E. Messrs. Kirchner and Myers.

63s—Perspective. Principles and methods of perspective as applied to architectural drawing. 2 cred.; prereq., 61; III F; 206E, VII-IX W; 309E. Messrs. Kirchner and Myers.

64f—The Graphic Arts. Introduction. Field, development, and application in art and industry. Elementary principles of design. Discussion of materials, style, and technique. Exercises including the construction of simple graphs. 2 cred.; jr., sr. in the School of Business Administration; prereq., 15 cred. in econ.; IV MW; 206E. Mr. Kirchner.

65w—The Graphic Arts—Format and Layout. Analysis of the standard type faces. Study of specimens of fine printing. Exercises: simple layouts, including lettering associated with type. Open to students in the School of Business Administration. 2 cred.; prereq., 15 cred. in econ.; IV MW; 206E. Mr. Kirchner.

66s—The Graphic Arts—Processes. Design and composition including the use of illustrations in black and white, line, and color. Discussion of the various processes of printing, lithography, and engraving. Exercises in planning for text and display work. Open to students in the School of Business Administration. 2 cred.; prereq., 15 cred. in econ.; IV MW; 206E. Mr. Kirchner.

69f,w,s,su—Exercises in Lettering. (Nurses.) See School of Nursing bulletin. 1 cred. per qtr. Messrs. Myers, Archibald, French, Potter, and Williams.

71f,w,s—Graphics. Representation and computation of complex quantities, rotating vectors, hyperbolic functions, and their application to direct and alternating current circuits. 3 cred.; prereq., 3, M.&M. 12. Mr. Eggers.

71f IV MWF; 139EE

71w I MWF; 139EE

71s I MWF; 209Ex

* Must register also in Draw. 62.

- 81f,w,s-82f,w,s-83f,w,s—Advanced Drawing. 3 cred. per qtr.; prereq., 43 or equivalent. Messrs. Kirchner and Brainard.
- 86f,w,s-87f,w,s—Anatomical Drawing. 3 cred. per qtr.; prereq., 43 or equivalent. Messrs. Kirchner and Brainard.
- 111f,w,s-112f,w,s-113f,w,s—Advanced Descriptive Geometry. Methods of representation; parallel and central projection. Curves and surfaces, geometrography, axonometry, and photogrammetry. 3 cred. per qtr.; prereq., 3, calculus. Messrs. Kirchner, Eggers, and Levens.
- 114f,w,s—Perspective. Principles and practice of perspective, including shadows, reflections, distortions, corrections, systems, methods, the practical problem, and inverse construction. 3 cred.; prereq., 63. Mr. Kirchner.
- 157f-158w-159s—Graphical Methods. Theory and construction of graphic charts and diagrams. Course can be entered at any quarter. 2 cred. per qtr.; prereq., soph. draw., M.&M. 26. Messrs. Kirchner, Eggers, and Levens.
 157f IV MW; 21E
 158w IV MF; 139EE
 159s I MF; 5E
- 215f-216w-217s—Geometry. Pure and applied. Transformations, perspective, kinematics, stereotomy, graphic statics, graphic calculus, nomography. 3 cred. per qtr.; prereq., calculus. Mr. Kirchner.
- 218f,w,s-219w-220s—Nomography. Technique and theory of computing charts. Equations of three and more variables. Determination of constants of empirical equations. 3 cred. per qtr.; prereq., 3, M.&M. 128. Messrs. Kirchner, Eggers, and Levens.

ECONOMICS

- 3w,s—The Mechanism of Exchange. Elementary course in money and banking. Study of financial institutions and their relations as parts of the financial structure. Relation of financial organization to the economic organization. 5 cred.; no prereq. Mr. Stehman.
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| 3w | Lect. III TTh; BuAud | |
| | Rec. (1) I TThS | (4) IV MWF |
| | (2) II MWF; 6B | (5) V MWF; 202B |
| | (3) III MWF | (6) VI MWF |
| 3s | Lect. III TTh; BuAud | |
| | Rec. (1) I MWF; 6B | (8) V MWF; 303B |
| | (2) I TThS; 302B | (9) V MWF; 6B |
| | (3) II MWF; 6B | (10) VI MWF |
| | (4) II TThS | (11) VI MWF |
| | (5) III MWF; 209B | (12) VII MWF; 102B |
| | (6) IV MWF | (13) VII MWF; 6B |
| | (7) IV MWF | (14) VIII MWF; 102B |
- 8f-9w—General Economics. (Eng., Arch., Chem.) Principles of economics with special emphasis upon their application to current problems such as money, banking, conservation, insurance, international commerce, monopolies, transportation, labor, socialism, public ownership, and finance. 3 cred. per qtr.; no prereq. Messrs. Filipetti, McCracken, and Manning.
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| (1) I MWF; 136E | (3) III MWF; 135E |
| (2) II MWF; 135E | (4) IV MWF; 135E |

14f,w,s—Elements of Statistics. Elementary concepts in statistical method; averages, ratios, errors, sampling, index numbers, graphic representation, collection of material. 5 cred.; prereq., 8, 9. Mr. Mudgett.

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| 14f | (1) I MWThFS | (3) IV MTWFS |
| | (2) III MWThFS; 303B | (4) VI MTWThF; 6B |
| 14w | (1) III MTWFS | (3) VI MTWThF; 102B |
| | (2) IV MTWFS | (4) VII MTWThF; 303B |
| 14s | (1) I MWThFS | (4) IV MTWFS; 209B |
| | (2) II MWThFS | (5) VI MTWThF |
| | (3) III MTWFS | |

20f,w,s—Elements of Accounting. Fundamental principles underlying bookkeeping and accounting. Sufficient practice in technical processes will be given to serve as a background for more advanced work. Preparation and analysis of statements. Open only to Engineering Pre-Business students. Other engineering students register in 29. 3 cred.; no prereq. Mr. Heilman.

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| 20f | (1) I MWF; 303B | (6) III TThS; 302B |
| | (2) I TThS; 302B | (7) V MWF; 302B |
| | (3) II MWF | (8) VI MWF; 302B |
| | (4) II TThS | (9) VII MWF; 302B |
| | (5) III MWF; 302B | |
| 20w | (1) I TThS; 303B | (3) III MWF; 301B |
| | (2) III TThS; 303B | (4) VI MWF; 6B |
| 20s | (1) I MWF; 303B | (4) IV MWF; 302B |
| | (2) I TThS; 301B | (5) VI MWF; 303B |
| | (3) III TThS; 301B | (6) VII MWF; 303B |

25w,s-26f,s—Principles of Accounting. Course following Econ. 20 presenting the principles underlying the accounting statements, the accounts, principles of valuation, depreciation, preparation and analysis of statements. 4 cred. per qtr.; prereq., 20. Mr. Heilman.

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| 25w-26s(1) | I MWF; 302B | (4) III MWF; 303B |
| (2) | II MWF; 302B | (5) IV MWF; 301B |
| (3) | II TThS; 301B | (6) VI MWF; 301B |
| 25s | (1) II MWF; 303B | (3) V MWF; 302B |
| | (2) III TThS; 303B | |
| 26f | (1) II TThS; 302B | (2) IV MWF; 302B |

28f,s—Business Law. Business law arranged for engineers, including the law of contracts, suretyship, agency, partnership, corporations, negotiable instruments, conveyance patents, and riparian rights. 3 cred.; soph., jr., sr. with 6 cred. in econ. or sr. without econ. cred.; I MWF; 135E. Mr. Palmer.

29f,s—Principles of Accounting. (Eng., Arch., Chem.) Purpose and principles of account classification; capital and revenue; accruals; valuation; depreciation; preparation and interpretation of balance sheets, income accounts, and other statements. 3 hrs. of lect. a week. 3 cred.; no prereq. Mr. Heilman.

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| 29f | I MWF; 5E |
| 29s | I MWF; 107E |

149f,w,s—Business Cycles. Analysis of factors involved in business fluctuations. Comparison of theories of the cause of prosperity and depression. Introduction to the statistical data and methods of business forecasting. 3 cred.; sr., grad.; prereq., 3 and 8, 9. Messrs. Marget and Myers.

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| 149f | I TThS; 202B |
| 149w | (1) I MWF; 209B |
| 149s | III MWF; 102B |

- 161f,w,s—Labor Problems and Trade Unionism. Discussion of employment; hours; wages; extent and strongholds of unionism; open and closed shops; collective bargaining; industrial unrest; government regulation of labor disputes. 3 cred.; prereq., 8, 9. Messrs. Hansen and Stead.
 161f IV MWF; 202B
 161w III TThS; 209B
 161s III TThS; 102B

BUSINESS ADMINISTRATION

- 51f,s-52w-53s—Business Law.* 51. Contracts. 52. Agency, Partnership, Corporations. 53. Negotiable Instruments. 3 cred. per qtr.; jr., sr.; prereq., for 51, 8 and 9, for 52 and 53, 51. Mr. Dalzell.
 51f,52w,53s Lect. IV T; PhAud
 Rec. (1) I ThS; 301F
 (2) II ThS; 301F
 (3) III ThS; 301F
 51s V MWF; 209B
- 58f,w,s§—Elements of Public Finance. Public expenditures, revenues, and debts. Special attention is given to tax principles, practices, and burdens. This is a condensed course given especially for business administration students. 3 cred.; jr., sr.; prereq., 8, 9. Mr. Blakey.
 58f IV MWF; 209B
 58w II MWF; 209B
 58s IV MWF; 202B
- 71f,w,†—Traffic Management. Survey of the rail, water, and highway transportation facilities, services, rates, and laws in their relation to business establishments; the executive's organization and management problems in handling freight, express, and mail shipments. 3 cred.; prereq., 8, 9.
 71f I MWF; 6B
 71w,s VI MWF; 202B
- 77f,s—Survey in Marketing. (An introductory course.) The principles of production economics and of price as illustrated in marketing. Commodity classifications, market functions, description of market organizations. 3 cred.; jr., sr.; not open to students who have credit for Econ. 16. Mr. Cassaday.
 77f I TThS; 6B
 77s I TThS; 202B
- 89f,w,s—Production Management. Analysis of the procedure and methods of production in industrial plants, the factors involved in production management, the means of effecting control. 3 cred.; prereq., 8, 9. Mr. Filipetti.
 89f II MWF; 202B
 89w II MWF; 202B
 89s I MWF; 209B
- 100f,w,s—Report Writing. 1 cred.; jr., sr. Mr. Heilman.
 100f VI T; 202B
 100w IV T; 202B
 100s VI T; 202B

* No credit will be given for 51, 52, or 53 until all three are completed.

† Students may not receive credit for both Econ. 172 and B.A. 71.

§ Credit may not be received for both Econ. 191-192 and B.A. 58.

101f,w-102w,s†‡—Advanced General Economics. A study of some of the more important theoretical problems of economics; competitive and monopoly prices; equilibrium prices and costs; theories of valuation of producers' goods; capital earnings and interest rates; profits. 3 cred. per qtr.; sr.; prereq., 8, 9. Messrs. Mudgett and Schmidt.

101f-102w (1) II TThS; 6B (3) IV MWF; 102B

(2) III MWF; 102B

101w-102s I TThS; 102B

109w,s—Business Policy. This course is devoted to the study of problems of a general administrative character. Cases involving broad business policies are presented for class discussion and reports. These cases involve questions of valuation, budgetary control, industrial promotions, and combinations and reorganization. 3 cred.; sr., grad.; prereq., 101, 102. Messrs. Ostlund and Wiedenhammer.

109w VII MWF; 301B

109s II MWF; 202B

130f,s—Cost Accounting. (General survey.) 3 cred.; prereq., 29; I TThS; 303B. Mr. Ostlund.

132f,s—Cost Accounting. 5 cred.; prereq., 29. II MTWThF; 303B. Mr. Ostlund.

133s—Cost Accounting Methods. 3 cred.; prereq., 131, 132; II TThS; 303B. Mr. Ostlund.

139f,w,s—Advanced General Accounting. A course intended particularly for the general student of business. Interpretation of accounts and statements, statement preparation, and analysis. Utilization of the statements by the executive. The use of budgets in business. Accounting methods and statements in a number of business fields. 3 cred.; jr., sr., grad.; prereq., 25, 26. Mr. Heilman.

139f IV MWF; 303B

139w VI MWF; 302B

139s (1) III MWF; 302B

(2) IV MWF; 302B

142f,w,s—Money and Banking. Advanced Course. 3 cred.; jr., sr., grad.; prereq., 3 and 8, 9. Messrs. Marget and Meyers.

142f (1) II MWF; 202B

(2) VI MWF; 202B

142w (1) II TThS; 209B

(2) IV MWF; 303B

142s II TThS; 209B

155f,w,s—Corporation Finance. 3 cred.; prereq., 8, 9; III MWF; 202B. Mr. Stehman.

165f,w,s—The Economics of Public Utilities. Economic and legal bases of classification. Relative advantages of public ownership and regulation. Central and municipal regulation compared. Basis of rates; relative rates; rates and service. Summary of the theories of valuation. 3 cred.; prereq., 8, 9; III TThS; 202B. Messrs. Garver and Schmidt.

167w—Personnel Administration. Managerial policy for various types of organization of labor. Special attention to job analysis, employment, incentives, and regulation of employment. 3 cred.; prereq., 8, 9; I TThS; 208B. Mr. Stead.

† The entire course must be completed before credit is received for any quarter.

‡ Credit may not be received for both B.A. 101-102 and B.A. 107.

180-181-182G—Senior Topics Course—Production Management. Selected problems in management; studies in the technique of executive control in manufacturing enterprises; field research and surveys in the organization and methods of management of Northwest industrial concerns. 9 cred.; prereq., 89, 130; VI MWF; 209B. Mr. Filipetti.

(See School of Business Administration bulletin, Part II.)

ELECTRICAL ENGINEERING†

11f-13w-15s—Elements of Electrical Engineering. Introduction to the development, principles, materials, safety, and general applications of electrical engineering. 3 cred. per qtr.; prereq., reg. in phys., and not more than 1 qtr. behind in math. Mr. Todd.

11f	Lect. (1) III TThS; 138EE (2) I TThS; 238EE	(3) III TThS; 339EE (4) I TThS; 138EE
13w	Lect. (1) III TThS; 139EE (2) I TThS; 36EE	(3) III TThS; 339EE (4) I TThS; 238EE
	Lab. (1) VI-VII M; 21EE (2) VI-VII T; 21EE (3) VIII-IX M; 21EE (4) VIII-IX F; 21EE	(5) VIII-IX T; 21EE (6) VIII-IX Th; 21EE (7) VI-VII W; 21EE (8) VI-VII Th; 21EE
15s	Lect. (1) III TThS; 237EE (2) I TThS; 238EE	(3) III TTh; 139EE (4) I TThS; 36EE
	Lab. (1) VIII-IX M; 21EE (2) VIII-IX W; 21EE (3) VIII-IX T; 21EE (4) VIII-IX Th; 21EE	(5) VI-VII W; 21EE (6) VI-VII Th; 21EE (7) VI-VII T; 21EE (8) VII-VIII F; 21EE

111f-113w-115s—Junior Electrical Engineering. Alternating-current circuits and machinery. 5 cred. per qtr.; prereq., 11, 13, 15. Mr. Johnson.

111f	(1) I MTWFS; 237EE	(2) II MTWFS; 237EE
112w	(1) I MWThFS; 237EE	(2) II MWThFS; 237EE
113s	(1) I MTWThF; 237EE	(2) II MTWThF; 237EE

112f-114w-116s—Junior Electrical Engineering Laboratory. Taken with Courses 111, 113, 115. Experimental study of alternating-current circuits and machinery. 2 cred. per qtr.; prereq., reg. in 111, 113, 115.

112f	(1) VI-IX M; 107EE (2) VI-IX T; 107EE (3) VI-IX W; 107EE	(4) VI-IX Th; 107EE (5) VI-IX F; 107EE
114w	(1) VI-IX M; 107EE (2) VI-IX T; 107EE (3) VI-IX W; 107EE	(4) VI-IX Th; 107EE (5) VI-IX F; 107EE
116s	(1) VI-IX M; 107EE (2) VI-IX T; 107EE (3) VI-IX W; 107EE	(4) VI-IX Th; 107EE (5) VI-IX F; 107EE

121f-123w-125s—Senior Electrical Engineering. Theory of alternating and direct current machinery. 3 cred. per qtr.; prereq., 115, 116. Messrs. Bryant and Johnson.

(1) III MWF; 237EE	(2) IV MWF; 237EE
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† In courses continuing through three quarters, the work of each quarter is prerequisite for following quarters.

122f-124w-126s—Senior Electrical Engineering Laboratory. Operating characteristics of alternating and direct current machinery. 2 cred. per qtr.; prereq., 116 and reg. in 121, 123, 125.

(1) VI-IX T; 107EE

(3) VI-IX Th; 107EE

(2) VI-IX W; 107EE

(4) VI-IX F; 107EE

127f-128w-129s—Transient Electrical Phenomena. Mathematical study of electric circuits during sudden changes of conditions. Classical and operational methods of analysis applied to electric circuits and machines, and use of the oscillograph in the analysis of these problems. 3 cred. per qtr.; prereq., reg. in 121, 123, 125; I TTh; 139EE; VI-VIII W; 107EE. Mr. Bryant.

138f-139w-140s—Slow Transients. Short-circuit currents in power networks, unbalanced loads in polyphase circuits, transformers and motors, harmonics, stability of power systems under steady state conditions. 3 cred. per qtr.; prereq., reg. in 121, 123, or 125; II MWF; 339EE. Messrs. Bryant, Caverley, and Johnson.

DESIGN

132f-134w-136s—Electrical Design. The design of direct current generators and motors, alternating current transformers, generators and synchronous motors. 2 cred. per qtr.; prereq., for 132, 115; for 134 and 136, 121. Mr. Kuhlmann.

(1) IV TS; 335EE

(2) II TS; 335EE

232w-234s-236f—Electrical Design. Special problems. 2 cred. per qtr.; prereq., 132, 134, 136. Mr. Kuhlmann.

237s—Power Transmission Line Design. Preparation of detailed plans and specifications for construction of high voltage transmission lines and distributing systems. 3 cred.; prereq., 134, 142. Mr. W. T. Ryan.

ELECTRIC POWER

36f-37w-38s—Electric Power. Similar to 43-44-45. 3 cred. per qtr.; sr. M.E.; prereq., Phys. 43, 44.

36f-37w Lect. III MW; 238EE

Lab. (1) I-II W; 107EE

(2) II-III F; 107EE

38s Lect. III MF; 238EE

Lab. (1) II-III W; 107EE

(2) I-II T; 107EE

40f—Electric Wiring and Equipment. Elements of direct and alternating current circuits. Interior wiring and electrical equipment of buildings. Elements of illumination. 2 cred.; sr. arch. and arch. engr.; prereq., Phys. 43; III MW; 138EE. Mr. Todd.

41f—Electric Power. Elementary principles of continuous and alternating currents, generators, and motors, transmission and distribution. Measurement of power. 3 cred.; sr. mines; prereq., Phys. 43.

Lect. II TTh; 138EE

Lab. I-III F; 107EE

42w,s—Electric Power. Similar to 41. Sr. C.E. 4 cred.; prereq., Phys. 43, 44.

Lect. I TThS; 138EE

Lab. III-IV T; 107EE

43f-44w-45s—Electric Power. Elementary study of the generation, distribution, measurement, and utilization of electric power. 3 cred. per qtr.; sr. chem. eng.; prereq., Phys. 43, 44.

43f-44w Lect. III TTh; 139EE(f); 138EE(w)

Lab. (1) I-II T; 107EE

(2) I-II S; 107EE

45s Lect. III TTh; 138EE

Lab. (1) II-III F; 107EE

(2) I-II S; 107EE

- 46f-47w-48s—Electric Power. Similar to 43-44-45. 3 cred. per qtr.; sr. Aero.E.; prereq., Phys. 43, 44.
 Lect. VI MF; 237EE
 46f Lab. (1) I-II Th; 107EE (2) III-IV M; 107EE
 47w (1) I-II Th; 107EE (2) II-III M; 107EE
 48s (1) I-II Th; 107EE (2) III-IV S; 107EE
- 49w—Electric Motors. Elementary principles of direct and alternating current motors. Applications to elevators and ventilation equipment. 2 cred.; sr. arch. engr.; prereq., 40; III WF; 138EE. Mr. Todd.
- 141f—Central Stations. Electric power generating stations and distributing systems. Load diagrams. Selection of prime movers and units. Cost of electrical energy. Methods of charging. Maintenance of plants. 2 cred.; prereq., reg. in 121; III TTh; 237EE. Mr. W. T. Ryan.
- 142w—Electrical Transmission. Consideration involved in the designing and building of transmission lines. Kelvin's law and its limitations. Transmission line as a mechanical structure. Lightning arresters. 2 cred.; prereq., reg. in 123; III TTh; 237EE. Mr. W. T. Ryan.
- 144w—Railway Electrical Engineering. Principles of mechanics applied to electric train movements. 2 cred.; prereq., 42 or 45 or 48 or 115; IV T, III S; 237EE. Mr. Johnson.
- 145s—Railroad Electrification. Reasons for electrification. Study of European and American systems. Results of electrification. 2 cred.; prereq., 144; IV T, III S; 339EE. Mr. Johnson.

ILLUMINATING ENGINEERING

- 151f—Illuminating Engineering. Nature of light. Laws of vision. Principles of illumination. Photometry. Sources of light and their characteristics. Lighting equipment. Illumination requirements and calculation for various fields of use. 2 cred.; prereq., Phys. 43; IV T, III S; 237EE. Mr. Johnson.
- 152f—Photometric Laboratory. Photometer practice. Distribution curves of lamps and reflectors. Measurement of lighting installations. 1 cred.; prereq., reg. in 151; VI-VII Th; ar. Mr. Johnson.
- 153w-154s—Illumination Problems. Illumination design and specifications applied to problems in street, residence, industrial, commercial, and other kinds of lighting. 2 cred. per qtr.; prereq., 151. (Not offered in 1932-33.)
- 251w-253s—Illuminating Engineering. Lectures and laboratory work. Methods of determining locations, kind, and quality of lights for obtaining desired illumination. 2 cred. per qtr.; prereq., 151. Mr. Johnson.

TELEPHONE AND TELEGRAPH ENGINEERING

- 64f-65w-66s—Elements of Communication. Theoretical and laboratory study of communication circuits and apparatus. Simplex, duplex, multiplex telegraph systems. Speed of transmission. Magneto, common battery, manual,

automatic telephone systems. 2 cred. per qtr.; prereq., reg. in 111, 113, 115. Mr. Hartig.

Lect. III T; 238EE

Lab. (1) VI-VII T; 307EE

(2) VIII-IX T; 307EE

(3) VI-VII W; 307EE

(4) VIII-IX W; 307EE

164f-165w-166s—Electric Communication. Telephone circuits at audio and carrier frequencies. Theoretical and laboratory study of circuits having distributed constants. Use of hyperbolic functions. Wave filters, balancing networks, equalizers, repeaters. 3 cred. per qtr.; prereq., 66. Mr. Hartig.

Lect. I MW; 138EE

Lab. (1) VI-VIII Th; 307EE

(2) VI-VIII F; 307EE

215f-216w-217s—Electronics. Theoretical and laboratory study of the following subjects with aspects of their engineering applications. Electron emission from hot bodies, Richardson's equation, Langmuir-Childs equation, secondary electron emission, ionization and resonance potentials, external and internal photoelectric effect, positive ion emission, shot effect, discharge of electricity through gasses, "getter" action, Barkhausen-Kurtz effect, ionization due to radioactivities, etc., Heavyside layer as a reflecting and a refracting medium, long period echo effect, electron waves, vacuum gauges, vacuum technic, etc. 2 cred. per qtr.; reg. by permission of instructor. Mr. Webb.

267f-268w-269s—Telephone Transmission. Advanced transmission theory at communication frequencies. Class and laboratory. 2 or 3 cred.; reg. by permission. Mr. Hartig.

272f-273w-274s—Electromechanical Vibrating Systems and Engineering Acoustics. Theoretical discussion of the production of sound by electrically driven vibrating systems, sound transmission, reflection, absorption. Laboratory study of vibrating systems, pipes, horns, absorbing materials, sound pressure, articulation, reverberation, resonance, sound filters. 2 cred.; open to grad. and sr. by permission; prereq., M.&M. 151. Mr. Hartig.

287f-288w-289s—Advanced Communication Laboratory and Seminar. Special problems in communication. Study and discussion of current articles on communication. 2 or 3 cred.; reg. by permission. Mr. Hartig.

RADIO ENGINEERING

161f-162w-163s—Radio Communication. Theoretical and laboratory study of radio transmitting and receiving circuits and apparatus. Amplifiers, detectors, oscillators. Electromagnetic waves in free space and on antenna systems. 3 cred. per qtr.; prereq., reg. in 121, 123, 125. Mr. Webb.

Lect. II MW; 335EE

Lab. (1) VI-VII M; 308EE

(2) VIII-IX M; 308EE

(3) VI-VII T; 308EE

(4) VIII-IX T; 308EE

(5) VI-VII W; 308EE

261f-263w-265s—Advanced Radio Communication. Theoretical study of the transmission of electromagnetic waves. Design and testing of radio transmitting and receiving apparatus. Theory of electron tubes and their use in radio circuits. High frequency measurements. Taken with 262-264-266. 2 cred. per qtr.; reg. by permission. II TTh; 339EE. Mr. Webb.

- 262f-264w-266s—Advanced Radio Laboratory. Special problems in radio laboratory and station, usually taken in connection with Course 261-263-265. For students specializing in electrical communication. 1 or more cred. per qtr.; reg. by permission. Mr. Webb.
- 270f—Radio Transmission. Design and operation of modern transmitting equipment, with special emphasis on broadcast transmission. Graduate course, open to sr. by permission of instructor. 2 cred. Mr. Webb.
- 271w—Radio Receiver Design. Detailed study of the problems arising in broadcast receiver design. Graduate course, open to sr. by permission of instructor. 2 cred. Mr. Webb.

RESEARCH

- 171w-172s—Undergraduate Thesis. Investigation of some approved problem in electrical engineering. 3 to 6 cred. per qtr.; prereq., 121.
- 275f-276w-277s—Electrical Engineering Research. Investigation of special problems in laboratory or library. 2 to 6 cred. per qtr.; grad.

MEASUREMENT

- 81w—Electrical Engineering Measurements. Principles of electrical measuring instruments, construction, limitations, sources of error, methods of calibration. Methods of measuring voltage, current, watts, watt hours, resistance, inductance, mutual inductance, capacity. 3 cred.; prereq., 111. Mr. Todd.
Lect. IV MW; 339EE
Lab. VI-VII M; 107EE
- 181s—Communication Frequency Measurements. Vector treatment of network. Bridge circuits for measuring of resistance, inductance, and capacity of audio and radio frequencies. 2 cred.; prereq., 126. Mr. Hartig.
- 183f-184w-185s—Special Electrical Laboratory. Efficiency tests and special problems. 2 cred. per qtr.; 2 to 12 cred. total; prereq., 116. Mr. Springer and others.
- 186w,s—High Tension Testing. Low-high frequency to several million voltage, applied to study of dielectric phenomena, such as testing high tension transmission cables, transformer oil, transmission line insulators. 2 cred.; prereq., 123, 124, or reg. in 123 or 124, and by permission. Mr. Springer.
- 187f-188w-189s—Special Communication Laboratory. Special problems in electrical communication. Includes a weekly seminar meeting. 1 to 2 cred. per qtr.; 1 to 12 cred. total; jr., sr., grad. by permission. Mr. Hartig.
- 281w-282s—Advanced High Frequency Measurements. Vector treatment of circuit networks. Bridge circuits for the measurement of resistance, inductance, and capacity at audio and radio frequencies. 2 cred. per qtr.; prereq., 126.
- 284w-285s-286f—Precise Electrical Engineering Measurements. Measurements of resistance, voltage, current, self-induction, and capacity; standardization of measuring instruments. 2 cred. per qtr.; prereq., 122.

GENERAL

- 91s,su—Inspection Trip. Personally conducted inspection of factories, power plants, and other places of engineering interest. During spring recess or in summer, costing about \$50 for each person. 1 cred.; prereq., 11.

- 93s—Seminar. Weekly discussion of current engineering periodicals and reports on assigned topics. 1 cred.; no prereq.; jr. EE. (Not offered in 1932-33.)
- 149s—Protection Engineering. The application of relays, circuit breakers, lighting arrestors and other protective equipment to power circuits for apparatus protection and isolation of faults. Calculation of fault currents. Effect of fault condition on system stability. 3 cred.; prereq., reg. in 125. Mr. Johnson.
- 156s—Vacuum Tube and Control Devices. Two, three, four, and five electrode vacuum tubes. Thyration, kenotron, grid glow, photo-electric tubes, etc. Theoretical study of apparatus and circuits with demonstrations. 2 cred.; sr. only; not open to students having credit in 161; IV MW; 139EE. Messrs. Hartig and Webb.
- 191f-192w-193s—Seminar. Weekly discussion of current electrical periodicals. 1 cred. per qtr.; prereq., 111.
- 211f-212w-213s—Advanced Circuit Analysis. Circuit analysis using Heaviside's *Operational Calculus*. 2 cred. per qtr.; grad.; prereq., M.&M. 151. Mr. Hartig. (Not offered in 1932-33.)
- 291f-292w-293s—Graduate Seminar. Discussion problems and results of research work. 1 cred. per qtr.; prereq., 126. (Not offered in 1932-33.)
- 294f-295w-296s—Electrical Ignition and Automobile Electrical Accessories. Study of ignition apparatus; characteristics of automobile accessories, such as generators, starters, controllers, electrical transmitting devices, etc. 2 cred. per qtr.; prereq., 124. Mr. Springer.

ENGLISH

- 4f,w-5w,s-6s—Rhetoric and Composition. Review of grammar; principles of composition; constant practice in writing. Studies in literature. 3 cred. per qtr.; no prereq. Messrs. Richardson, Becklund, Guthrie, Haga, Montgomery, and Rusinko.

4f	(1) IV MWF; 107E	(9) I MWF; 320E
	(2) IV MWF; 104E	(10) II MWF; 107E
	(3) IV MWF; 22E	(11) II MWF; 104E
	(4) III TThS; 107E	(12) II MWF; 22E
	(5) III TThS; 104E	(13) VII MWF; 107E
	(6) III TThS; 136E	(14) VII MWF; 104E
	(7) I MWF; 107E	(15) VII MWF; 215E
	(8) I MWF; 104E	
4w	(1) IV MWF; 136E	(2) VII MWF; 205E
5w	(1) III MWS; 107E	(7) VII MWF; 107E
	(2) III MWS; 215E	(8) VII MWF; 203E
	(3) III MWS; 22E	(9) VII MWF; 206E
	(4) IV MWF; 203E	(10) VI MWF; 107E
	(5) IV MWF; 215E	(11) VI MWF; 215E
	(6) IV MWF; 138EE	(12) VI MWF; 206E
5s	(1) IV MWF; 215E	(2) V MWF; 107E
6s	(1) III MWF; 107E	(7) I TThS; 107E
	(2) III MWF; 203E	(8) I TThS; 203E
	(3) III MWF; 7E	(9) I TThS; 205E
	(4) VI MT; III S; 107E	(10) VII MWTh; 107E
	(5) VI MT; III S; 203E	(11) VII MWTh; 203E
	(6) VI MT; III S; 206E	(12) VII MWTh; 215E

- 7w,8s—Explorations in Literature. An attempt to introduce world literature to the student through a study of books and their authors. 3 cred. per qtr.; prereq., 6 or equiv.; IV MWF; 107E. Mr. Richardson.
- 31s—Technical Writing. Quarter course in business letters, reports, etc., planned to meet the professional needs of engineering students. 3 cred.; prereq., 6; I MWF; 215E. Mr. Haga.

FORESTRY

- 1f—General Forestry. A brief history of the development of forestry in Europe and America; its bearing on the forestry problems of the United States; description of the United States forests. Lectures and collateral reading. 3 cred.; no prereq.; III TThS; 102Hr(UF). Mr. Cheyney.
- 27w—Farm Woodlots and Windbreaks. Trees and their relation to the farm. Planning and planting farm windbreaks and shelter belts. Utilization and marketing of farm grove, or woodlot products. 3 cred.; no prereq.; IV MWF; 301Hr(UF). Mr. Cheyney.

GENERAL ENGINEERING

- 11f-12w—Orientation. General lectures for vocational guidance covering the various phases of engineering and allied professions. Introduction to the University. Illustrated by lantern slides and moving pictures. Given by various members of the university staff. No cred.; no prereq.; required of freshmen in Engineering and Architecture. Mr. Zelner.
11f IX Th; 100C
12w IX Th; 100C
- 81f,w,s—Estimating. Plan reading and quantity surveying. Study of costs of concrete, brick, timber, and steel construction. Analysis of material and labor costs. 3 cred.; jr., sr., only. Mr. French.
81f I MW; 2 hr ar; 36EE
81w IV MW; 2 hr ar; 36EE
81s I MW; 2 hr ar; 139EE
- 101w—Contracts and Specifications. Engineering specifications. Classes of specifications; essential features; clauses, details. Bids and bidders, engineering contracts. 3 cred.; jr. and sr. only; IV MWF; 238EE. Mr. Kibbey.
- 111s—Valuation of Public Utility Properties. Factors affecting value, depreciation, taxation, and regulation of public utility properties. Elements of engineering economics; cost analysis, economic investigations, rate making. 2 cred.; sr. and grad. only; III TTh; 339EE. Mr. W. T. Ryan.
- 112f-113w-114s—Rates for Public Utility Properties. Determination of the rate base and depreciation amount for transportation, gas, water, electric power and telephone utilities operating expenses, the rate structure for particular utilities, service and discrimination. 3 cred. per qtr.; senior and graduate students in engineering only. Mr. Bryant.
- 193s—Engineering Practice. Engineering relations, legal and ethical, collaboration and consultation; technical reports, investigation and estimates. Professional employment, ownership of plans, patents and rights of invention.

Day labor and contract systems of construction; public and private works, arbitration. 2 cred.; sr. only. Mr. Martenis.

(1) II M, III Th; 254ME

(2) III TTh; 254ME

GEOLOGY AND MINERALOGY

1f,su-3w—General Geology (Dynamic and Economic). A synoptical treatment of the materials of the earth and the origin, distribution, and occurrence of metals, non-metals, coal, and petroleum. 10 cred.; no prereq. Mr. Emmons.

Lect. III TThFS; 110P

Af-Cw—General Geology Laboratory (General and Economic). 2 cred.; no prereq. Mr. Emmons.

Lab. III-IV MW; or VI-VII TTh; 212P(f), 100P(w)

5f—Engineering Geology. Materials of the earth and geologic processes. Application of geology to engineering problems. Lectures, rock study, and reference work. 3 cred.; no prereq.; I MWF; 110P. Mr. Schwartz.

6w—Applied Geology for Engineers. Occurrence, properties, production, and uses of building stones, cements, clay, fuels, and road materials. Lectures and reference work. 3 cred.; prereq., 5; I MWF; 110P. Mr. Schwartz.

7s—Applied Geology for Engineers. Includes a brief survey of the occurrence of the important metals. Lecture and reference work; 3 cred.; prereq., 6; I MWF; 110P. Mr. Schwartz.

23w-24s—Elements of Mineralogy. The crystal systems; morphological, physical, and chemical characters of minerals; occurrence, genesis, and use of minerals; classification and description of common minerals, rock minerals, and common rocks. Determinative work in laboratory, blowpipe analysis, sight identification. 8 cred.; prereq., Inorg. Chem. 10. Mr. Gruner.

23w Lect. II WF; 206P

Rec. VII T; 210P

Lab. (1) VII-VIII WF; 100P

(2) III MWThFS; 3E

24s Lect. II MWF; 206P

Rec. IX T

Lab. (1) VII-VIII M; VI-VII

(2) III-IV M; VII-VIII F;

T; 100P

100P

67f—Mineralogy of Chemical Materials. Lectures on special laboratory methods of mineralogy, nature and identification of the chief commercial minerals, and the world's supply and market for the same. Laboratory work in identification and tests of the value of minerals. 3 cred.; prereq., 6 qtr. cred. of chemistry at University. Mr. Gruner.

121f—Crystallography. Study of crystal models and space groups. Crystal drawings and measurements. Projections and mathematical calculations. 3 cred.; prereq., M.&M. 11, and Inorg. Chem. 10. Mr. Gruner.

GERMAN

24f-25w-26s—Chemical German. Pronunciation, reading, sentence analysis, and translation. 4 cred. per qtr.; no prereq.

(1) IV MTWF; 101F

(3) V MTWF; 207F

(2) IV MTWF; 209F

HORTICULTURE

- 6f—Fruit Growing. Fundamental principles of fruit growing. Sites, soils, nursery stock, planting and planting plans, tillage, fertilization, cover crops, pollination, frost avoidance, pruning and thinning. Lectures, recitations, references, and laboratory. 3 cred.; no prereq. Messrs. Alderman and Brierley.
Lect. II MW; 102Hr(UF)
Lab. (1) I-II F; 8Hr(UF) (2) VII-VIII M; 8Hr(UF)
- 51s—Garden Flowers. A study of the common annuals, biennials and perennial flowers, with special emphasis on plants for the perennial border and rock garden. Lectures, reference reading and laboratory. 2 cred.; I T, I-II Th; 8Hr(UF). Mr. Longley. (Not offered in 1933-34.)
- 70su*—Plant Materials. Garden flowers, identification, classification, and landscape uses. Lectures and field trips. 3 cred.; prereq., 10 cred. Bot.; 3Hr(UF).
- 71f—Elementary Landscape Design and Plant Materials. A study of the elementary principles of landscape design; the identification of evergreen and deciduous trees and shrubs and vines, with special emphasis on their fall and winter characters and their uses in landscape design. Lectures, outdoor and indoor laboratories, special field trips. 3 cred.; prereq., Bot. 10 cred.; II Th, I-II TS; 107Hr(UF). Mr. Longley.
- 72s—Woody Plants and Garden Flowers. Deciduous and evergreen trees, shrubs and vines from their winter and spring characters, with special emphasis on their flower characters; herbaceous annuals, biennials, perennials, including bulbs and their uses in landscape planting. Lectures, indoor and outdoor laboratories, with special field trips. 2 cred.; prereq., Bot. 10 cred.; II T, I-II S; 107Hr(UF). Mr. Longley.
- 74w—Principles of Landscape Design. The composition of the various elements used in landscape gardening, methods of presentation. Lectures and problems. 3 cred.; prereq., Arch. 21 or Ag.E. 3 and Hort. 71; VIII T, VI-VII TTh; 107Hr(UF). Mr. Longley.
- 75w—Landscape Problems. Continuation of Course 74. 3 cred.; ar.; 305En(UF). Mr. Longley.
- 76s—Landscape Construction. Construction and maintenance of turf for lawns, golf courses, and other play areas; garden architecture, grading, planting and care, costs of construction. Lectures, field trips and resorts. 3 cred.; prereq., 71; III T, VI-VII TTh; 107Hr(UF). Mr. Longley.

MATHEMATICS AND MECHANICS

MATHEMATICS

- 11f,w,su—College Algebra. Theory of quadratic equations, interpretation of complex results, graphical representation, indeterminate equations, ratio, proportion, variation, progressions, series, undetermined coefficients, binomial theorem, logarithms, theory of equations, Horner's method. 5 cred.; prereq., higher algebra.

* Given by special arrangement.

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| 11f | (1) III MWThFS; 4E | (9) VI MTWThF; 106E |
| | (2) III MWThFS; 3E | (10) I MTWFS; 4E |
| | (3) III MWThS; 22E; F; 107E | (11) I MTWFS; 21E |
| | (4) VII MTWThF; 4E | (12) I MTWFS; 22E |
| | (5) VII MTWThF; 3E | (13) VIII MTWF, IV S; 4E |
| | (6) VII MTWThF; 136E | (14) VIII MTWF, IV S; 3E |
| | (7) VI MTWThF; 4E | (15) VIII MTWF, IV S; 136E |
| | (8) VI MTWThF; 3E | |
| 11w | (1) II MTWFS; 3E | (4) I MTWFS; 3E |
| | (2) VIII MTWThF; 3E | (5) VII MTWF, IV S; 3E |
| | (3) VI MTWThF; 3E | |

12f,w,s,su—Trigonometry. Graphical representation of functions, computation by logarithms and slide rule. Trigonometric functions, plane right triangles, reduction formulas, fundamental relations, addition formulas, double angles, half angles, identities and equations, inverse functions, oblique triangles, De Moivre's theorem, spherical right triangles. 5 cred.; prereq., 11. Mr. McClintock.

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| 12f | V MTWFS; 335EE | |
| 12w | (1) II MTWFS; 4E | (6) VI MTWThF; 205E |
| | (2) II MTWFS; 7E | (7) I MTWFS; 4E |
| | (3) VIII MTWThF; 4E | (8) I MTWFS; 203E |
| | (4) VIII MTWThF; 106E | (9) VII MTWF, IV S; 4E |
| | (5) VI MTWThF; 4E | (10) VII MTWF, IV S; 21E |
| 12s | (1) II MTWThF; 3E | (4) I MTWThS; 3E |
| | (2) III MTWThF; 3E | (5) VI MTWTh; IV S; 3E |
| | (3) VIII MTWThF; 3E | |

13f,w,s,su—Analytical Geometry. Co-ordinate systems, locus and equation, straight line, circle, parabola, ellipse, hyperbola. Transformation of co-ordinates and simplification of equations. Polar co-ordinates, higher plane curves, tangents, normals. Empirical equations, solid analytic geometry. 5 cred.; prereq., 11 and 12.

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| 13f | Quiz (all sections) IX T; 305E | |
| | Rec.: | |
| | (1) V MTF, II S; 136E | (3) III MWThF; 205E |
| | (2) VIII MWF, VII Th; 205E | (4) VII MWF, VIII Th; 205E |
| 13w | Quiz (all sections) VIII T; 305E | |
| | Rec.: | |
| | (1) II MWThF; 136E | (3) VII MWThF; 136E |
| | (2) VI MWThF; 136E | |
| 13s | (1) II MTWThF; 4E | (6) VIII MTWThF; 106E |
| | (2) II MTWThF; 5E | (7) I MTWThS; 4E |
| | (3) III MTWThF; 4E | (8) I MTWThS; 106E |
| | (4) III MTWThF; 22E | (9) VI MTWTh, IV S; 4E |
| | (5) VIII MTWThF; 4E | (10) VI MTWTh, IV S; 136E |

24f,w,s,su—Differential Calculus. Limit, derivative, simple applications of derivative, maxima and minima, differentials, rates, change of variables, radius of curvature, mean value, indeterminate forms, partial differentiation, series. 5 cred.; prereq., 13. Mr. Siler.

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| 24f | (1) II MTWThF; 106E | (4) III MTWThF; 106E |
| | (2) IV MTWFS; 106E | (5) VII MTWF, VIII Th; 106E |
| | (3) VIII MTWF, VII Th; 106E | |
| 24w | (1) VI MTWTh, II S; 104E | (4) VII MTWThF; 106E |
| | (2) IV MTWFS; 104E | (5) III MTWThF; 106E |
| | (3) II MTWThF; 104E | |
| 24s | (1) I MTWThF; 104E | (2) V MTWFS; 136E |

- 25f,w,s,su—Integral Calculus. Expansion of functions, Taylor's theorem. Standard elementary forms, definite integral, rational fractions, integration by substitution, by parts, reduction formulas, integration a process of summation, successive and partial integration, elementary ordinary differential equations. 5 cred.; prereq., 24. Mr. Dalaker.
- 25f V MTWFS; 205E
- 25w (1) VI MTWTh, II S; 106E (4) VII MTWThF; 106E
(2) IV MTWFS; 106E (5) III MTWThF; 106E
(3) II MTWThF; 106E
- 25s (1) VII MTWThF; 106E (3) III MTWFS; 104E
(2) II MTWThF; 203E (4) IV MTWFS; 104E
- 91f,w*—Calculus (Arch., Pre-bus.). Short course, derivatives, maxima and minima, integration of simple forms, definite integrals, areas. 4 cred.; prereq., 13. Mr. Wilcox.
- 91f VI MTWF; 206E
- 91w II MWThF; 36EE
- 124f—Numerical and Graphical Analysis. Practical applications of freshman and sophomore mathematics on engineering problems. Theory of errors. Numerical solution of equations. Interpolation, approximation, least squares, least maximal error. Numerical and graphical differentiation and integration. Simpson, Tchebyschoff. 3 cred.; prereq., 25; I MWF; 7E. Mr. Sadowsky.
- 125w—Numerical and Graphical Analysis. Practical applications of freshman and sophomore mathematics on engineering problems. Graphical integration of differential equations. Isoclines, successive corrections. Periodical processes, Fourier's series; numerical, graphical, and instrumental analysis of vibrations. Approximation by orthogonal functions. 3 cred.; prereq., 25; I MWF; 7E. Mr. Sadowsky.
- 126s—Numerical and Graphical Analysis. Practical applications of freshman and sophomore mathematics on engineering problems. Conformal mapping for engineers. Applications on electrostatics, hydrodynamics, aerodynamics, physics. Alignment charts (nomography). Mathematical instruments. 3 cred.; prereq., 25; I MWF; 7E. Mr. Sadowsky.
- 151f—Differential Equations. Differential equations and their solutions. First order and first degree, first order and higher degree, singular solutions; total differential equations, linear differential equations, miscellaneous methods, system of simultaneous equations, integration in series. Partial differential equations. 3 cred.; prereq., 25; IV MWF; 7E.
- 152w-153s—Advanced Calculus and Applications. 3 cred. per qtr.; prereq., 151; IV MWF; 7E.
- 154f-155w-156s—Vector Analysis and Applications. 3 cred. per qtr.; prereq., 26; IV MWF; 5E. Mr. Brooke.
- 157f-158w-159s—Determinants and Solid Analytical Geometry. An advanced course. 3 cred. per qtr.; prereq., 151. (Not offered in 1932-33.)
- 254f-255w-256s—Modern Analysis. Based on Whittaker and Watson's text. 3 cred. per qtr.; prereq., 153. (Not offered in 1932-33.)
- 261f-262w-263s—Functions of a Complex Variable. Elliptic functions and integrals with applications. 3 cred. per qtr.; prereq., 153. Mr. Dalaker.
- 264f-265w-266s—Advanced Topics in Functions of Complex Variable. 3 cred. per qtr.; prereq., 263. (Not offered in 1932-33.)

MECHANICS

26f,w,s,su—Technical Mechanics: Statics. Characteristics of a force, parallelogram law, moments, couples, resultant of a force system, equilibrium of a force system, frictions, centroids, moments of inertia, catenary. 5 cred.; prereq., 25. Messrs. Herrick and Doeringsfeld.

26f (1) V MTWFS; 106E (2) II MTWThF; 136E

26w II MTWF; 106E, S; 136E

26s (1) VII MTWThF; 104E (3) III MTWFS; 136E
(2) II MTWThF; 106E (4) IV MTWFS; 106E

84f,s*—Technical Mechanics. (Chem., Ch.E., Agr.E., and Pre-bus.) Statics, resolution of forces, conditions of equilibrium, center of gravity, moment of inertia, stresses in framed structures, and machines, kinematics, dynamics of a particle. Newton's laws of motion, work, energy, power, impulse, and momentum. 5 cred.; prereq., 25 or 91. Mr. Doeringsfeld.

84f II MWF, VI TTh; 215E

84s III MWThFS; 215E

92w*—Mechanics for Architects. Statics, resolution of forces, conditions of equilibrium, center of gravity, moment of inertia of plane sections, stresses in framed structures. 4 cred.; prereq., 91; VI MWThF; 203E. Mr. Wilcox.

127f,w,s—Technical Mechanics: Dynamics. Force, mass, acceleration, translation and rotation, gyroscope, governors, work, energy, power, conservation of energy, impulse, momentum, loss of kinetic energy, conservation of momentum. 5 cred.; prereq., 26. Messrs. Wilcox and Doeringsfeld.

127f (1) III MTThFS; 215E (2) I MTWFS; 205E

127w (1) II MWThFS; 203E (3) IV MTWFS; 205E
(2) III MTWThF; 205E (4) V MTWF, III S; 205E

127s (1) MTWThF; 136E (2) III MTWThF; 106E

161f-162w-163s—Advanced Technical Mechanics. Special problems in the dynamics of machinery; vibration, balancing, whirling shafts, rapidly rotating disks, dynamical stability, gyroscope. 3 cred. per qtr.; prereq., 127. Mr. Wilcox.

161f IV MWF; 36EE

162w I MWF; 36EE

163s IV MWF; 36EE

267f-268w-269s—Advanced Dynamics. Text, Routh's *Rigid Dynamics*, Vol. I. 3 cred. per qtr.; prereq., 153. Mr. Brooke.

274f-275w-276s—Advanced Dynamics of a Particle. 3 cred. per qtr.; prereq., 127. Mr. Brooke.

277f-278w-279s—Advanced Statics. Text, Routh's *Analytical Statics*. 3 cred. per qtr.; prereq., 127. (Not offered in 1932-33.)

MATERIALS

85f*—Strength of Materials with Laboratory. (Ch.E. and Pre-bus.) Mechanical and elastic properties of materials of construction, beams, shafts, columns, combined stresses, dynamic stresses. 4 cred.; prereq., 84. Mr. Miller.

Lect. II MWF; 203E

Lab. (1) II-III Th; Ex

(2) VI-VII M; Ex

* For permissible substitute, see page 62.

- 93s*—Strength of Materials. (Arch.) Mechanical and elastic properties of materials of construction, design of riveted joints, beam theory, columns, arches. 4 cred.; prereq., 91; IV MWFS; 203E. Mr. Wilcox.
- 128f,w,s—Strength of Materials. Mechanical and elastic properties of materials of construction, beams, shafts, columns, combined stresses, hollow cylinder rollers, plates, curved bars, springs, dynamic stresses, true stresses. 5 cred.; prereq., 26. Messrs. Priester and Miller.
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| 128f | (1) IV MTWFS; 205E | (3) III MWThFS; 206E |
| | (2) I MTWThF; 106E | |
| 128w | (1) I MTWFS; 106E | (3) III MTWThF; 215E |
| | (2) II MTWThF; 22E | |
| 128s | (1) II MTWThF; 110Ex | (3) III MTWThF; 205E |
| | (2) IV MTWFS; 205E | |
- 141f,w,s—Materials Testing Laboratory. Investigation of the physical properties of various metals and engineering materials (wood, cement, ropes, etc.). Standard methods of testing. 2 cred.; prereq., 128 or reg. in 128. Messrs. Priester and Miller.
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| 141f | Lect. (1) VI F; 110Ex | (2) VI M; 110Ex |
| | Lab. (1) VII-IX F; Ex | (3) VII-IX T; Ex |
| | (2) II-IV T; Ex | (4) I-III S; Ex |
| 141w | Lect. (1) VI W; 110Ex | (2) VI F; 110Ex |
| | Lab. (1) II-IV S; Ex | (3) VII-IX T; Ex |
| | (2) VII-IX F; Ex | (4) VII-IX W; Ex |
| 141s | Lect. (1) VI Th; 110Ex | (2) VI W; 110Ex |
| | Lab. (1) VI-VIII F; Ex | (3) VII-IX W; Ex |
| | (2) VII-IX Th; Ex | (4) VII-IX T; Ex |
- 144w—Materials Testing Laboratory. (Mines.) Four laboratory hours accompanying Mine Mech. 110. VI-IX Th; Ex. Mr. Priester.
- 180f-181w-182s—Advanced Strength of Materials. Special problems in applied elasticity. 3 cred. per qtr.; prereq., 128; IV MWF; 203E(f), 110Ex(w), 4E(s). Mr. Priester.
- 184f-185w-186s—Advanced Testing Materials Laboratory. Special problems relating to the physical properties of engineering materials. 2 cred. per qtr.; prereq., 141. Mr. Priester.
- 294f-295w-296s—Mathematical Theory of Elasticity. 3 cred. per qtr.; prereq., 128, 153. (Not offered in 1932-33.)

HYDRAULICS

- 86w*—Hydraulics. (Ch.E. and Agr.E.) Hydrostatics, Bernoulli's theorem, flow through orifices, pipes, and over weirs, dynamic action of jets and streams, flow of gases through pipes. 2 cred.; prereq., 84. II MF; 205E. Mr. Doeringsfeld.
- 129f,w,s—Hydraulics. Laws of equilibrium of fluids, flow through orifices and over weirs, pressure and flow through tubes and pipes, flow in conduits and rivers, dynamic pressure of water, elementary principles of turbines and pumps. 4 cred.; prereq., 26. Mr. Straub.

* For permissible substitute, see page 62.

- 129f Lect. (all sections) I Th; 335EF
 Rec. (1) II MWF; 205E (3) IV MWF; 215E
 (2) III MWF; 136E
- 129w Lect. (all sections) III W; 110Ex
 Rec. (1) I MTF; 205E (2) IV MFS; 22E
- 129s Lect. (all sections) VI Th; 110Ex
 Rec. (1) MWF; 205E (2) II TThS; 215E
- 130f—Open Channel Flow. Theory of uniform and varied flow in open channels, with practical applications to the design of hydraulic structures; computations for drawdown curves, backwater curves, hydraulic jump, measuring flumes, submerged weirs, etc. 3 cred.; prereq., 129 and 143; I MWF; 206E. Mr. Straub.
- 132w-133s-134f—Advanced Hydraulic Problems. Special problems in hydraulic design. 2 cred. per qtr.; prereq., 130 or reg. in 130. Mr. Straub.
- 143f,w,s—Hydraulics Laboratory. Experimental and demonstrational work. Pressure head, Piezometer tubes, gages, stability of flotation, Bernoulli's theorem. Venturi meter, flow through orifices, over weirs, and through pipes. Open channels, gaging, impact on vanes, pumps, and hydraulic machines 1 cred.; prereq., 86 or 129 or reg. in 86 or 129. Mr. Straub.
- 143f (1) III-IV T; Ex (4) VI-VII T; Ex
 (2) VI-VII W; Ex (5) VI-VII Th; Ex
 (3) III-IV S; Ex
- 143w (1) I-II S; Ex (4) I-II Th; Ex
 (2) VIII-IX T; Ex (5) VI-VII M; Ex
 (3) VIII-IX F; Ex
- 143s (1) VI-VII M; Ex (3) I-II Th; Ex
 (2) VIII-IX Th; Ex
- 191w—Hydraulic Motors and Pumps. Study of the hydraulic theory of the ram, impulse wheel, reaction turbine, and centrifugal pump. 3 cred.; prereq., 129; III TThS; 5E. Mr. Straub.
- 192s—Natural and Artificial Waterways. Wave motion, tides, ship resistance, transportation of sediment. Control and regulation of rivers, design of ship canals, locks, dry docks, movable dams, harbors. 3 cred.; prereq., 129 and preferably 130; I MWF; 206E. Mr. Straub.
- 193w—Hydraulic Measurements. Hydraulic similitude. Detailed study of the current meter. Venturi meter, weir, orifice, Parshall flume, traveling screen, chemical method of gaging, etc. 3 cred.; prereq., 129; I MWF; 206E. Mr. Straub.
- 194f-195w-196s—Advanced Hydraulics Laboratory. Special experimental studies concerning the characteristic of turbines, pumps, etc. Hydraulic models. 2 cred. per qtr.; prereq., 129 and 143; ar. Mr. Straub.
- 281f-282w-283s—Hydrodynamics. 3 cred. per qtr.; prereq., 129, 153. Mr. Brooke.
- 284f-285w-286s—Advanced Hydrodynamics. 3 cred. per qtr.; prereq., 283. Mr. Brooke.

MECHANICAL ENGINEERING

MACHINE CONSTRUCTION

- 1su—Machine Woodworking. Operation and setting up of woodworking machinery; care and manipulation of adjustable parts. Layout and plan of course and equipment for high school or junior college, including problems in

- cabinet making and wood construction. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 2su—Bench Work. Bench and vise work in metal chipping, filing, scraping, fitting, polishing, and layout practice; planning of courses of study for school work. 2 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Ray.
- 3su—Elementary Machine Shop Practice. Lathe, shaper, planer, and drill press manipulation; the grinding, care, and kinds of cutting tools. Layout of courses and exercises for high school courses. This course can be arranged to include part of 2su. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Ray.
- 4su—Wood Turning. Operation and adjustment of the lathe; care and manipulation of wood turning hand tools. Turning between centers, face plate, and check work. Plan and arrangement of projects suitable for a high school course. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 5su—Wood Finishing. Preparatory treatment of wood surfaces, color mixing, application of oil and acid stains, shellacking, varnishing, enameling, rubbing, and finishing. Polychrome projects, layout, building up of design, application and blending of colors. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 6su—Pattern Practice. Pattern layout. Partings, draft, shrinkage and finish allowance. Building and assembly of materials, core prints and core boxes, color symbols. The relation of pattern and foundry practice. Industrial problems and methods, lectures and notes. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 7su—Advanced Machine Shop. Advanced lathe work, milling machine operation. Production work. Gear calculation, and cutting. Precision grinding. Layout of typical course. 2 to 4 cred.; prereq., 3; I-IX MT, I-IV WF, I-II Th; ME. Mr. Ray.
- 9su—General Metal Work. Special arrangements for individual needs. Care and use of metal working tools. Arrangements may be made for precision grinding, gear cutting, tool making, heat treatment, and acetylene welding. Planning equipment and projects for a high school course. 2 to 4 cred.; no prereq.; ar. Mr. Ray.
- 10su—Furniture Making. Details of designs and construction. Doweling, mortise, and tenon work. Bending and setting of shapers. Value and materials used in built-up work. Laying of veneers. Layout of a course in high school furniture making. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 11f,w,s,su—Pattern Practice. Study and application of methods and principles used in constructing and using patterns and core boxes in the production of castings. Shop drawings and materials used. Manipulation and care of wood-working tools and machinery. Inspection trips and reports. 2 cred.; no prereq. Mr. Richards.
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| 11f Lect. IX M; 202ME | Lab. VII-VIII Th, II-IV F |
| 11w Lect. I Th; 202ME | Lab. VIII-IX M, II-III Th |
| 11s Lect. (1) VIII W; 202ME | (2) III Th; 202ME |
| Lab. (1) VI-IX Th | (2) I-IV M |

12f,w,s—Foundry Practice. Theory and practice in mixing, molding, and casting of ferrous and non-ferrous metals. Preparation of materials used in making cores and molds. Bench, floor, and machine molding. Inspection trips and reports. 2 cred.; no prereq. Mr. Moffett.

12f Lect. (1) IX T; 153ME (2) IX F; 153ME
Lab. (1) VI-IX Th (2) I-IV T

12w Lect. (1) I Th; 153ME (3) VI Th; 153ME
(2) VII T; 153ME
Lab. (1) VIII-IX M, II-III Th (3) I-IV T
(2) I-IV F

12s Lect. (1) IV W; 153ME (3) VII T; 153ME
(2) VII M; 153ME (4) VIII M; 153ME
Lab. (1) VI-IX Th (3) I-IV T
(2) I-IV M (4) VI-IX F

13f,w,s—Forge Practice. Lectures and discussions on modern forge and drop forge practices, industrial welding methods, steels and their treatment. Practice in welding, hardening, tempering, and die forging. Plant inspection and reports. 2 cred.; no prereq. Mr. Hughes.

13f Lect. IX M; 153ME (2) VI M; 153ME
Lab. (1) VI-IX Th (2) I-IV T

13w Lect. (1) III Th; 153ME (3) VII T; 153ME
(2) VIII F; 153ME
Lab. (1) I-IV F (3) I-IV T
(2) VI-IX Th

13s Lect. (1) I W; 153ME (3) III T; 153ME
(2) III Th; 153ME
Lab. (1) VI-IX Th (3) VI-IX F
(2) I-IV M

14f,w,s—Pattern Practice. Care and use of wood working tools and machinery; practice in making patterns, sweeps and core boxes for various types of work; planning from blue prints the construction of patterns and core boxes for complex castings; study of paints, oils, varnishes, lacquers, and stains for finishing. 2 cred.; prereq., Chem. 5, Dr. 2. Mr. Richards.

14f Lect. (1) III W; 202ME (2) VIII T; 202ME
Lab. (1) II-V T (2) VI-IX W

14w Lect. (1) II W; 202ME (3) III T; 202ME
(2) VII W; 202ME
Lab. (1) III-IV W, VIII-IX M (3) VI-IX F
(2) VI-IX T

14s Lect. VIII F; 202ME Lab. VI-IX T

15f,w,s—Foundry Practice. Laboratory practice in green and dry sand molding; core making; casting in iron, brass, and aluminum; testing sand for permeability, strength of bond, moisture and hardness; cupola practice and operation of brass furnace; chemistry of melting, purifying and alloying of metals. 2 cred.; prereq., Chem. 5, Dr. 2. Mr. Moffett.

15f Lect. (1) VI T; 153ME (3) III Th; 153ME
(2) VI F; 153ME

Lab. (1) II-V S (3) I-IV W
(2) VI-IX M

15w Lect. VII Th; 153ME Lab. VI-IX F

15s Lect. III F; 153ME Lab. VI-IX W

16f,w,s—Forging, Heat Treating, and Welding. Forging and heat treatment of metals; operation of gas, oil and electric furnaces; thermit welding, electric arc, gas and spot welding theory and operation; brazing and soldering of ferrous and non-ferrous metals. 2 cred.; prereq., Chem. 5, Dr. 2. Mr. Hughes.

16f	Lect. (1) I M; 153ME (2) III W; 153ME	(3) I S; 153ME (4) VIII M; 153ME
	Lab. (1) II-III M, I-II W (2) II-V S	(3) VI-IX F (4) V-VIII T
16w	Lect. (1) III W; 153ME Lab. (1) I-IV M	(2) VIII T; 153ME (2) VI-IX W
16s	Lect. (1) IV T; 153ME (2) III W; 153ME Lab. (1) VI-IX M (2) VI-IX W	(3) III F; 153ME (3) I-IV S

17f,w,s,su*—Machine Shop Practice. (Chem., Chem. Engr., and Pre-bus.). 2 cred.; no prereq. Mr. Ray.

17f	Lect. III T; 202ME	Lab. VI-IX Th
17w	Lect. (1) VIII M; 202ME Lab. (1) VI-IX Th	(2) VII Th; 202ME (2) I-IV T
17s	Lect. (1) VIII M; 202ME Lab. (1) I-IV T	(2) III T; 202ME (2) VI-IX F

18f,w,s—General Woodworking. For teachers desiring elementary or advanced practice in manual training, wood turning, and pattern making. Planning and layout of projects, materials used, care and operation of woodworking tools and machinery; selection and installation of equipment. 3 cred.; no prereq. Mr. Richards.

19s,su*—Machine Shop Practice. Elementary course in machine work arranged especially for students in electrical engineering. 2 cred.; prereq., 16. Mr. Ray.

Lect. (1) I S; 202ME (2) III F; 202ME	(3) I Th; 202ME (4) IV S; 202ME
Lab. (1) V-VIII T (2) II-V S	(3) VI-IX M (4) VI-IX Th

71f,su—Machine Shop Practice. Care and operation of machine tools; screw cutting, taper turning, and gear cutting, including spur, helical, worm, and bevel gears. 3 cred.; prereq., 14, 15, 16. Messrs. Koepke and Ray.

Lect. (1) II M; 202ME (2) VII T; 202ME	(3) IX F; 202ME (4) IX M; 202ME
Lab. (1) VI-IX T, II-IV W (2) II-V T, I-III Th	(3) VI-VIII F, I-IV S (4) VI-IX M, VI-VIII W

72w,su—Advanced Machine Practice. Manufacturing methods, quantity production; also carbonizing and heat treatment of steel, autogenous welding and brazing. 3 cred.; prereq., 71. Messrs. Koepke and Ray.

Lect. (1) VI T; 202ME Lab. (1) VII-IX T, VI-IX F	(2) IX M; 202ME (2) VI-VIII M, VI-IX W
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* For permissible substitute, see page 62.

MACHINE DESIGN

- 20f—Elementary Machine Design. Screws, rivets, machine keys, cotttered joints and connections, hubs and rims of rotating parts. Factors of safety, drawing room systems and conventions. Lectures and drafting. 2 cred.; prereq., Dr. 2. Messrs. Martenis and Palmer.
- (1) II-III W, VIII-IX F, III-IV S; 151ME (3) VIII-IX M, VI-VII Th, III-IV S; 151ME
 (2) VI-VIII T, V-VII W; 151ME (4) II-III MWTh; 151ME
- 21s—Kinematics. Instant centers, centroids, point paths, gear tooth profiles, cam construction, velocity diagrams. Lectures and drafting. 2 cred.; prereq., M.E. 20. Messrs. Martenis and Palmer.
- (1) VI-VII WThF; 251ME (3) VIII-IX MW, IV-V T; 251ME
 (2) II-III TTh, VIII-IX F; 251ME
- 22f—Mechanism. Motion studies. Revolving and oscillating bodies, linkages, chains, flexible connectors, gearing, wheels in trains, epicyclic gear trains, worm and wheel, screws, straight line motions, hoists, pulley blocks, ratchets, intermittent motions. Recitations and problems. 3 cred.; prereq., 21 and M.&M. 24. Mr. Martenis.
- (1) I TThS; 252ME (3) VII MWF; 252ME
 (2) III MWF; 252ME
- 23w—Machine Design. Riveted joints, screwed fastenings, shafts and couplings, strength of gear teeth, flywheels, engine details, machine frames, steam piping, bearings. Lectures and drafting. 3 cred.; prereq., 22, and M.&M. 26. Messrs. Palmer and J. J. Ryan.
- Lect. (1) II MW; 254ME (2) I TTh; 254ME
 Lab. (1) II-IV T, VII-IX W; 255ME (2) VI-VIII T, I-III S; 255ME
- 24s—Machine Design. Design of machines and hoisting equipment with reference to complex stresses. Lectures and recitations. 3 cred.; prereq., 23, and M.&M. 128. Mr. J. J. Ryan.
- (1) III MWF; 252ME (2) II WThS; 252ME
- 26w—Mechanism and Kinematics. (E.E., Aero.E., and Ag.E.) Transmission of motion. Levers, linkwork, flexible connections, gearing, screws, cams, epicyclic trains, parallel motions, quick return motions, graphical studies of velocities. Intermittent motion, escapements. Recitations and problems. 3 cred.; prereq., M.&M. 24. Mr. Martenis.
- (1) IV TS, VI Th; 252ME (4) II MWF; 252ME
 (2) IV MWF; 252ME (5) I TThS; 252ME
 (3) III TThS; 252ME
- 27s—Machine Design. (Aero.E. and Ag.E.) Calculation of machine parts, riveted joints, screwed fastenings, rotating pieces, belted connections, gearing, bearings. Lectures and drafting. 3 cred.; prereq., 26. Mr. Martenis.
- Lect. (1) VI M; 254ME (2) I T; 254ME
 Lab. (1) VII-IX MF; 255ME (2) VI-VIII T, I-III S; 255ME
- 28s—Machine Design. (Chem.E.) Screw fastenings, riveted joints, belting, shafting, bearings, machine frames, pulleys, etc. Lectures, drafting, and problems. 3 cred.; prereq., M.&M. 85. Mr. Martenis.
- Lect. II T; 252ME
 Lab. (1) VI-VIII WF; 251ME (2) VI-VIII M, II-IV S; 251ME
- 121f-122w-123s—Advanced Engineering Design. Problems selected to suit the student's special interest. Automatic machines; machines for quantity pro-

duction; materials handling and heavy plant equipment. Drafting and problems. 2 cred. per qtr.; prereq., 24. Mr. J. J. Ryan.

- 121f (1) VI-VIII Th, I-III S; 255ME (2) VII-IX M, I-III Th; 255ME
 122w VII-IX MTh; 255ME
 123s VI-VIII WTh; 225ME

STEAM ENGINEERING

30f—Steam Engineering. Elementary study of the steam power plant, including boilers, stokers, furnaces, fuels, combustion, steam generation, and prime movers. 5 cred.; prereq., Phys. 23. Messrs. DuPriest and Easton.

- (1) IV MF, II S; 154ME (3) III MWF; 154ME
 (2) II MWF; 154ME (4) III TThS; 154ME

31w-32s—Thermodynamics. Heat and mechanical energy and the laws governing the operation of machines used to convert heat energy into mechanical energy. Steam, gas, and oil engines, air compressors, refrigeration machines, and turbines. 3 cred. per qtr.; prereq., 30. Messrs. DuPriest and Easton.

- 31w (1) III WF; 154ME; I-III Th; (3) III TTh; 154ME; VII-IX F; 151ME
 (2) I WF; 154ME; VI-VIII Th; (4) I TTh; 154ME; VI-VIII M; 151ME
 32s (1) II TTh, VII-IX Th; 154ME (3) II MW; 154ME; VII-IX T; 151ME
 (2) III MW; VI-VIII W; 154ME (4) III TTh, VII-IX F; 154ME

33f—Elementary Mechanical Laboratory. Calibration of pressure gages, anemometers, indicator springs. Use of steam calorimeters, planimeters, indicators. Calculations from indicator cards. Tests of mechanical appliances, lubricating oils. 2 cred.; prereq., reg. in 30.

- (1) VI-IX F; Ex (4) VI-IX M; Ex
 (2) VI-IX Th; Ex (5) VI-IX W; Ex
 (3) I-IV S; Ex (6) VI-IX T; Ex

34w—Mechanical Laboratory. Calibration of tachometers, pyrometers, steam flow meters. Valve setting. Flow of steam through orifices. Test of steam trap, surface condenser, simple steam engines. Inspection trip. 2 cred.; prereq., 33.

- (1) VI-IX M; Ex (2) VI-IX W; Ex

35s—Elementary Steam and Power Laboratory. Friction test of oils. Test of hot air engine, centrifugal fan, injector, steam pump, steam boiler. Calibration of transmission dynamometer. Power study of industrial machines. Approximate analysis of fuels. Use of Mahler, Bomb, and Junkers calorimeters. 2 cred.; prereq., 34, and reg. in 32.

- (1) VI-IX F; Ex (2) VI-IX T; Ex

36f—Elementary General Laboratory. (Mines.) Calibration of pressure gages, anemometers. Use of steam calorimeters, planimeters. Steam indicator practice, card calculation, valve setting. Tests of oils, simple steam engine and steam pump. 4 hours; prereq., accompanying Mine Mech. 112; VI-IX Th. Mr. Shoop.

38w-39s—Heat Engines. (Chem. E.) Study of steam properties, steam calorimetry, elementary thermodynamics, fuels, and combustion; calibration and use of instruments; valve setting; operation and testing of steam engines, boilers, compressors, stage evaporators, water heaters, and purifiers, gas

engines, etc. Selection of equipment for power plants. 3 cred. per qtr., prereq., Phys. 23.

38w Rec. IV MWF; 215Ex

39s Rec. IV WF; 215Ex

Lab. (1) VI-IX M; Ex

(2) VI-IX F; Ex

40f-41w—Heat Engines. (E.E.) Properties of steam; principle of operation of steam machinery; fuels, combustion, and smoke prevention; construction, operation and testing of engines, turbines, boilers, condensers, pumps, and power plant equipment. Selection of equipment for different types of plants. 3 cred. per qtr.; prereq., Phys. 23.

Rec. (1) II TS; 110Ex

(2) III WF; 209Ex

Lab. (1) VI-VIII F; Ex

(3) I-III Th; Ex

(2) VI-VIII Th; Ex

(4) VI-VIII M; Ex

42f,w,s—Heat Engines. (C.E. and Arch.) Steam generation and properties. Fuels and combustion. Construction and operation of boilers and auxiliaries. Elementary thermodynamics. Use and calibration of engine-room instruments. Types, details, and tests of steam engines, steam turbines, gas engines, and air compressors. Performance and adaptability of power equipment. 4 cred.; prereq., Phys. 23.

42f Rec. IV MWF; 215Ex

Lab. (1) VI-IX W; Ex

(2) I-IV S; Ex

43w Rec. I TThS; 209Ex

Lab. VI-IX W; Ex

42s Rec. I TThS; 209Ex

Lab. (1) VI-IX W; Ex

(2) II-V S; Ex

138w—Advanced General Laboratory. (Mines.) (a) Tests of air compressor, steam turbine, compound steam engine, centrifugal fan, gas engines. (b) The use of hydraulic measuring devices, weirs, differential gages, etc., in tests of centrifugal pumps, hydraulic turbines and rams. 4 hours; prereq., 36; VI-IX Th; Ex. Messrs. Shoop and Straub.

141f—Power Plant Engineering. Theory, practice, and economics relating to prime movers and steam generating equipment of the modern power plant, including auxiliary units such as condensers, heaters, purifiers, pumps, fans, piping, etc. 3 cred.; prereq., 32. Mr. Shoop.

(1) II MThF; 254ME

(2) IV MWF; 254ME

144w—Steam Turbines. Theory and practice applied to various types. Thermodynamics and mechanical analysis of problems involved in the design of nozzles, blades, rotors, etc. Condition of operation; systems of transmission; lubrication; economy; field of service. Laboratory investigation. 3 cred.; prereq., 32; IV MWF; 209Ex. Mr. Shoop.

145w—Applied Thermodynamics. Laws of heat transmission, mean temperature difference, in condensers, boilers, brine coils, feed water heaters. Treatment of cooling towers, accumulators, multiple stills, stage evaporators, vapor refrigeration; air compressors, multi staging, intercooling, etc. 3 cred.; prereq., 32, 35; II MWF; 209Ex. Mr. Shoop.

146s—Fuels and Combustion. Fuels: classification and analyses. Hand and stoker treatment; regulation. Pulverized and liquid fuels. Types of burners, controls. Combustion: generation of heat; furnace gases; stratification; flame way; smoke prevention. Furnaces. Lectures and recitations. 3 cred.; prereq., 141; IV MWF; 209Ex. Mr. Shoop.

- 147w—Design of Steam Machinery. Piping systems, furnace and gas passage dimensions, stokers, oil, gas, and pulverized fuel burners, superheaters, feed water heaters, and pumps, air pre-heaters, automatic controls, chimneys, etc. 2 cred.; prereq., 141; VI-VIII MTh; 151ME. Mr. Shoop.
- 148s—Design of Power Plant Units. Treatment of condensers, air pumps, cooling towers, stage evaporators, reheaters, etc. 2 cred.; prereq., 147; II-IV TW; 255ME. Mr. Shoop.
- 149f,w,s—Advanced Steam Laboratory. Tests of steam turbines, uniflow and compound steam engines, condensers, evaporators, and vacuum pumps. Tests of compound steam pump. Air compressor, boiler, superheater, and power plant. Studies of fluid flow meters and air-conditioning apparatus. 2 cred.; prereq., 32 and 35. Mr. Shoop.
 (1) I-IV T; Ex (2) (f,w) VI-IX T; Ex
 (2) (s) VI-IX Th; Ex
- 241s—Advanced Thermodynamics. Reversible changes of state and efflux of wet and superheated vapors. Flow of compressible fluids in mains, moving channels, into receivers, and communicating vessels. Gas mixtures, critical points, liquefaction. Power plant cycles: regenerative, reheating, and bleeding. 3 cred.; prereq., 145. Mr. Shoop.
- 242f-243w—Power Plant Design. Problems, designs, and estimates for power plants and central stations. Selection of motive powers, relative advantages of steam, producers, and gas plants. Choice of engines and boilers; pumps, piping, and accessories. 2 cred. per qtr.; prereq., 148. Mr. Shoop.
- 244s—Power Plant Management. Operation and maintenance of boilers, engines, steam turbines, and accessory apparatus. Smoke prevention, lubricants and lubrication. Power plant finance. Daily logs and power costs. Study of recent power researches. 3 cred.; prereq., 141. Mr. Shoop.

INTERNAL COMBUSTION ENGINES

- 50f,w,s—Auto and Airplane Engines. Principles and types. Electrical systems. Lubrication and cooling. Carburetors. Accessories. 3 cred.; soph. Messrs. Robertson and Ford.
 50f (1) II TThS; 209Ex (3) IV MWF; 110Ex
 (2) I MWF; 110Ex
- 50w (1) I MWF; 110Ex (2) IV TS, VI Th; 110Ex
- 50s (1) I MWF; 110Ex (2) IV MWF; 110Ex
- 55s—Internal Combustion Engines. (E.E.) Laws of gases; gas cycles, Otto, semi-Diesel, and Diesel engines. Carburetion, cooling, lubrication, and governing. Gas producers and power plants. 3 cred.; prereq., 41. Messrs. Robertson and Ford.
 Rec. (1) II TTh; 215Ex (2) III WF; 110Ex
 Lab. (1) VI-VIII M; Ex (3) VI-VIII T; Ex
 (2) I-III S; Ex (4) I-III Th; Ex
- 150f—Internal Combustion Engines. Laws of gases; gas cycles. Otto, semi-Diesel, and Diesel engines. Mechanism of various types. Carburetion, governing, cooling, lubrication. Combustion. Gas producers. 3 cred.; prereq., 30, 31. Mr. Robertson.
 (1) IV MF, III Th; 252ME (3) I MWF; 252ME
 (2) II MWS; 252ME

- 151w—Advanced Internal Combustion Engines. Special reference to automobile, truck, and airplane engines. Theoretical consideration of fuels, combustion, detonation, lubrication, etc. 3 cred.; prereq., 150; I MWF; 209Ex. Mr. Robertson.
- 152s—Aero Engine Testing. Use of modern research instruments and methods for testing. Experiments showing effect of fuel mixture, distribution, spark timing, etc., upon general engine performance. 2 cred.; prereq., 159; VI-VIII TF; Ex. Mr. Robertson.
- 153s—Automobile Fleet Maintenance. Study of available types of motor coaches and trucks, their design features from a maintenance viewpoint, a survey of service depot requirements with a study of fleet service methods and maintenance practice. Lectures and recitations. 3 cred.; seniors only; prereq., 150. Mr. Robertson.
- 154w—Design of Airplane Engines. Determination of sizes of cylinder bearings and important detail parts of radial and in-line aircraft engines; inertia forces, polar diagrams, etc. 2 cred.; prereq., 27, 150; II-IV WF; 251ME. Messrs. Robertson and Ford.
- 156w-157s—Design of Internal Combustion Engines. Calculations of inertia forces and size of cylinders for automobile, aircraft, and stationary service. Theoretical diagrams and detail of parts. 2 cred.; prereq., 121, 150. Messrs. Robertson and Ford.
 156w VII-IX W, I-III S; 251ME
 157s VI-VIII T, II-IV W; 251ME
- 158s—Aero Engine Testing. The use of modern instruments for testing gasoline, Diesel and aircraft engines. The use of dynamometers and torque stands in determining engine performance. 2 cred.; prereq., 150; VII-IX TF; Ex. Mr. Robertson.
- 159f,w,s—Internal Combustion Engine Laboratory. Tests of gasoline, semi-Diesel, and Diesel engines. Power plant units and automotive engines. 2 cred.; prereq., 150 or reg. in 150. Messrs. Robertson and Ford.
 (1) I-IV T; Ex
 (2) (f,w) VI-IX T; Ex
 (2) (s) VI-IX Th; Ex
- 251f-252w-253s—Automobile and Motor Truck Design. Theory and design of the automobile, motor truck engine and chassis, complete design of engine, transmission, and chassis. Lecture and drawing room. 2 cred. per qtr.; grad. Mr. Robertson.
- 254s—Gas Tractor Design. Selection of wheel sizes; horse power weight and drawbar pull. Bearing pressures; ratios and strength of gearing. Details of principal parts. 2 cred.; prereq., 156. Mr. Robertson.
- 255f-256w-257s—Automobile Testing and Research. Dynamometer and road tests including over-all efficiency of cars at various speeds, fuel consumption, effect of road surface on traction, efficiencies, and general performances. Special research problems. 2 cred. per qtr.; prereq., 155 or 159. Mr. Robertson.
- 258s—Motor Truck and Bus Transportation. Problems involving motor truck transportation, capacity of trucks, trailers, drawbar pull. Efficiencies. Effect of road surface. Freight handling. Analysis of costs of truck operation and maintenance. Relative costs of transportation. 3 cred.; prereq., 152. Mr. Robertson.

259w,s—Diesel Engines. An advanced course in the theory, design, operation, and economics of the Diesel engine. Lectures and assigned readings. 3 cred.; prereq., 150. Mr. Robertsen.

HEATING, VENTILATION, AND REFRIGERATION

63f—Heating and Ventilation. Principles of heating and ventilation. Warm air, steam, hot water, vapor, vacuum, and fan systems of heating; pipe systems; heat regulation. Ventilation and air conditioning, synthetic air chart, central station heating. Recitations, lectures. 3 cred.; prereq., 31, M.&M. 127, 129. Mr. Rowley.

Lect. VI MF; 209Ex

Rec. VI Th; 209Ex

163f—Heating and Ventilation. (Arch. E.) Principles of heating and ventilation including the design and layout of warm air, steam, hot water, vapor, vacuum, and fan systems of heating. Requirements and design of ventilating systems. General principles of central station heating. Recitation, lectures, and designs. 4 cred.; prereq., M.&M. 127, 128, 129; II MWF; 7E; VI-IX W; 217E. Mr. Rowley.

164s—Heating and Ventilation. (Arch.) Principles of heating and ventilation. Heating systems; furnaces, steam, hot water, vapor, vacuum and fan b'ast. Piping systems. Ventilation and air conditioning; humidification, synthetic air chart. Temperature regulation. 2 cred.; prereq., M.&M. 92; I TTh; 215Ex. Mr. Rowley.

165f,w—Advanced Heating and Ventilation. Special selected problems. 3 cred.; prereq., 63; I MWF; 209Ex(f), 215Ex(w). Mr. Rowley.

166s—Refrigeration. Principles of refrigeration. Various types of refrigerating machines, refrigerants, applications to ice making, cold storage, cooling of air, liquids, and solids. Lectures and recitations. 3 cred.; prereq., 32; I MWF; 252ME. Messrs. Rowley and Algren.

167w—Advanced Heating and Ventilation. 3 cred.; prereq., 165; IV MWF; 154ME. Mr. Rowley.

169f,w,s—Heating and Ventilation Laboratory. Tests of heating, ventilating, and air conditioning equipment. The determination of air qualities as required for comfort and for specific industries. Tests and studies of complete installation. 2 cred.; prereq., 35, 63 or reg. in 63. Mr. Algren.

(1) I-IV T; Ex

(2) (f,w) VI-IX T; Ex

(2) (s) VI-IX Th; Ex

265f,w,s—Advanced Heating and Ventilation. Taken in connection with research work in the laboratory. Cred. ar.; grad. only; prereq., 63. Mr. Rowley.

267w—Mechanical Equipment of Buildings. Selection of heating, ventilating, cooling, and plumbing systems for various types of buildings. Piping layouts, for fire protection, air, gas, and vacuum cleaning systems, elevators. Designs and layout of equipment. Lectures and drafting. 3 cred.; prereq., 63, Phys. 43. Mr. Martenis.

INDUSTRIAL ENGINEERING

70f—Mechanical Technology. Study of mechanical processes involved in various manufacturing industries and in the development and utilization of power. Lectures by various specialists. 1 cred.; open only to soph., jr., and sr.; IV MF; 305E. Mr. Richards.

- 74s—Safety Engineering. Safety of the worker; fire and other hazards; prevention of industrial accidents. Compensation laws. Fire prevention; construction; automatic sprinkler systems. Effect of safety on production. Factory sanitation. Safety organization. Lectures, assigned reading, factory inspections, and reports. 3 cred.; prereq., 72. Mr. Koepke.
- 170s—Tool Design and Construction. Tools, jigs, dies, and fixtures for manufacturing interchangeable parts. 3 cred. per qtr.; prereq., 15 or 72. Mr. Koepke.
- 171f,w—Production Control. Principles and practice involved in economical production. Standardization. Requirements for uniformity and interchangeability. Jigs, fixtures, and special equipment; gases and inspection systems. Divisions of labor. Conveying, handling, and stores control. Fatigue elimination. 3 cred.; prereq., sr. with 15 or 71. Mr. Koepke.
171f IV MWF; 202E
171w (1) VI MWF; 202ME (2) IV MWF; 202ME
- 172w—Industrial Plants. Factory organization and construction for economical manufacture. Organization of the industry. Location and type of buildings, power development. Layout of plant. Routing systems and machine layout. Heating and ventilating requirements. Lighting. Sanitation. Distribution of power. Welfare features. Lectures, recitations, and drawing room practice. 3 cred.; prereq., 171; I MWF; 202ME. Mr. Koepke.
- 173s—Industrial Management. General principles. Taylor system; wage, bonus, and profit sharing systems. Maintenance and depreciation. Purchasing. Allocation of cost, overhead, and machine burden. Graphical representation. 3 cred.; prereq., 172; I MWF; 202ME. Mr. Koepke.
- 174f—Industrial Management Laboratory. Planning department. Time and motion studies; rate setting. Instruction cards. Production control. Shop practice with investigations in local factories. Lectures, assigned reading practice, and reports. 2 cred.; prereq., 73 and reg. in 171; lect. VII W; 202ME, 3 hr. lab. ar. Mr. Koepke.
- 179s—Industrial Relations. Labor administration. Foreman training. Training the worker; job analysis. Employment and turnover; the human element, service departments. Stabilization of labor. Lectures, reading, shop visits and reports. 3 cred.; prereq., 174; IV MWF; 202ME. Mr. Koepke.
- 277f-278w-279s—Industrial Engineering Problems. Special investigations of practical problems and suggested methods of procedure. Lectures, assigned reading, shop visits, and reports. 3 cred. per qtr.; grad.; prereq., 173, 174. Mr. Koepke.

NAVAL ARCHITECTURE

- 85f,w,s—Ships and Shipping. Types and sizes of ships, tonnage and classification requirements, factors governing choice of size and type of ship. Introductory course touching on the commercial side of ship design. 1 cred.; soph., jr., sr.
- 185f,w,s—Theoretical Naval Architecture. Ship measurement; stability and trim; resistance, coefficients, speed, and powering. 2 cred.; jr., sr., preferably preceded by 85.
- 186f,w,s—Theoretical Naval Architecture. Strength of ship as a whole, and of various parts of the ship under local stresses; effect of rolling, pitching, and vibration. 2 cred.; jr., sr.

- 187f,w,s—Ship Drawing. Preliminary design of commercial ships, including consideration of mechanical equipment, with special emphasis on river and lake transportation. 2 cred.; prereq., 185, 186.

HYDRAULIC MACHINERY

- 189s—Hydraulic Machinery. Theory of operation, design, construction, and regulation of water turbines. Turbine testing; characteristics, selection of type. Cost of turbines and water power. 3 cred.; sr.; prereq., M.&M. 129; IV MWF; 154ME.

RAILWAY MECHANICAL ENGINEERING

- 281f—Railway Technology. Systematic course of visits to the various railroad shops in the vicinity to study locomotive details and classifications. Locomotive practice. Lectures and reports. 1 cred.; prereq., M.&M. 127, 128, 129. Mr. Martenis.
- 282f-283w-284s—Locomotive Design and Construction. Locomotive details. Design of boiler, cylinders, frame, springs, trucks, axles, wheels, running gear, equalizing arrangements, valve gears, lubrication. Lectures, assigned reading, and drafting. 3 cred. per qtr.; prereq., 271. Mr. Martenis.

SEMINAR AND RESEARCH

- 190f-191w-192s—Seminar. Reading of assigned articles in current technical press. Classroom presentation of principal features of assigned articles. 1 cred. per qtr.; jr., sr. Messrs. DuPriest and Robertson.
IV S; 154ME
- 194w,s—Advanced Engineering Problems. Opportunity will be offered for carrying on special investigations in the various fields of Mechanical Engineering. 2 cred.; registration by permission of the division chief in charge of work. Open only to sr. M.E.
- 290f-291w-292s—Mechanical Engineering Research. Courses may be elected which involve investigations in connection with lubrication, fuels, furnaces, boilers, steam engines, turbines, gas engines, heating and ventilation, industrial and other engineering problems. Reports, special problems, and related tests. Cred. as ar. per qtr.; prereq., 194 or reg. in 194. Messrs. DuPriest, Rowley, Shoop, Martenis, Koepke, and Robertson.

METALLOGRAPHY

- 150f—Metallography for Electrical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; study of typical alloys with special reference to electrical resistance, conductivity, magnets, etc. Laboratory work and demonstrations. 3 cred.; jr., sr. E.E. Mr. Forsyth.
Lect. I MW; 315M Lab. VI-VIII M; 307M
- 151w—Advanced Metallography for Electrical Engineers. Study of iron and steel, alloy steels, metals and alloys used in electrical engineering practice. Special problems for outside reading and for research. Laboratory work. 3 cred.; prereq., 150. Mr. Forsyth.
Lect. I MW; 315M Lab. VI-VIII M; 307M

- 152f—Metallography for Aeronautical Engineers. Principles; metallography of iron and steel with special references to alloy steels, and light alloys used in airplane construction. Laboratory work and demonstrations. 3 cred.; prereq., sr. Aero.E. Messrs. Dowdell and Jerabek.
Lect. I TS; 315M Lab. VII-IX M; 307M
- 156w—Metallography for Mechanical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; metallography and heat treatment of iron and steel. Laboratory work. 3 cred.; prereq., jr., sr. M.E. Mr. Dowdell.
Lect. III ThS; 315M
Lab. (1) VII-IX W; 307M (2) VII-IX F; 307M
- 157s—Advanced Metallography for Mechanical Engineers. Metallography of alloy steels, tool steels, high speed tool steels, and important non-ferrous alloys; metallography applied to engineering practice and specifications. Outside reading and special reports. Laboratory work. 3 cred.; prereq., 156. Mr. Dowdell.
Lect. I MW; 315M
Lab. (1) VII-IX W; 307M (2) VII-IX F; 307M
- 160f—Metallography. (Chem.) Principles of metallography, including constitution diagrams, preparation and standardization of thermocouples, preparation and thermal analysis of alloys, their microscopic examination and photomicrographs; typical alloy systems such as iron carbon (steel, cast iron), and some non-ferrous alloys. Lab. work; 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Jerabek.
Lect. III MF
Lab. (1) VI-VIII Th; 306M (2) Ar
- 161w—Advanced Metallography. (Chem.) Metallography and heat treatment of iron and steel, including alloy steels, commercial uses of various steels, and engineering specifications. Lab. work; 3 cred.; prereq., 160. Mr. Jerabek.
Lect. I MF
Lab. (1) VI-VIII Th; 306M (2) Ar
- 162s—Advanced Metallography. (Chem.) Metallography of the non-ferrous metals with a study of the constitution diagrams, properties, and uses of important commercial alloys. Lab. work; 3 cred.; prereq., 160. Mr. Jerabek.
Lect. III MF
Lab. (1) VI-VIII Th; 306M (2) Ar
- 163f—Advanced Metallography. Seminar work on recent advances in metallography. Lectures and recitations, with outside reading and special reports. May be accompanied by laboratory work. 3 cred.; prereq., 6 cred. in metallography. Mr. Dowdell.
- 164w—Advanced Metallography. Advanced consideration of the structures, properties, and uses of metals and alloys. May be accompanied by laboratory work. 3 cred.; prereq., 6 cred. in metallography. Mr. Dowdell.
- 165s—Advanced Metallography. Technical metallography as applied to the automotive industry. Lectures and special reports. May be accompanied by laboratory work. 3 cred.; prereq., 6 cred. in metallography. Mr. Dowdell.
- 201f-202w-203s—Advanced Metallography for Graduate Students. Intended primarily for research work. Mr. Dowdell

METALLURGY

- 3f—General Metallurgy. Combustion, fuels, refractory materials, furnaces, and fluxes. Lectures and recitations. 3 cred.; prereq., Inorg. Chem. 8 or equiv.; I TThS; 108M. Mr. Christianson.
- 4w—Metallurgy of Pig Iron. General principles of iron blast furnace practice. Construction of furnace, handling of stock and products, principles of regulations. Lect. and rec.; 3 cred.; prereq., 3; I TThS; 108M. Mr. Christianson.
- 5s—Metallurgy of Wrought Iron and Steel. General principles involved in the production of wrought iron and steel. Lect. and rec.; 3 cred.; prereq., 4; I TThS; 108M. Mr. Christianson.
- 106f—Metallurgy of the Base Metals. Lead, copper, zinc, and mercury. Consideration of smelting methods and principles involved in refining. Lect. and rec.; 4 cred.; prereq., 3; I F, III TThS; 108M. Mr. Pease.
- 107w—Metallurgy of the Base Metals. 4 cred.; prereq., 106; I F, III TThS; 108M. Mr. Pease.
- 108s—Metallurgy of the Precious Metals. Principles involved and methods used in the extraction of gold, silver, and other precious metals. Lect. and rec.; 4 cred.; prereq., 107; I F, III TThS; 108M. Mr. Pease.
- 109f—Metallurgy of Base Metals. (Ch.E., M.E.) Special consideration is given to mechanical appliances. Lect. and rec.; 3 cred.; prereq., Inorg. Chem. 8, 16 or equivalent; IV MWF; 108M. Messrs. Christianson and Pease.
- 109w—Metallurgy of Base Metals. (Chem. and elect. engr.) Special consideration is given to electrical appliances. Lect. and rec.; 3 cred.; prereq., Inorg. Chem. 8, 16 or equiv.; IV MWF; 108M. Messrs. Christianson and Pease.

MILITARY SCIENCE AND TACTICS

REQUIRED WORK

All physically fit male students are required to take instruction in military science for three hours each week during the first two undergraduate years of their course. Previous instruction in this subject at other institutions under an officer of the regular army detailed as professor of military science and tactics exempts the student from so much of this work as the length of his prior training justifies in each case. All students taking this course are given the instruction prescribed for the Basic Course, Senior Division, R.O.T.C. Students registered in Electrical Engineering are assigned to the Signal Corps, all others are assigned to the Coast Artillery. No credits are allowed for this work.

ELECTIVE WORK

Students who have completed the Basic Course, R.O.T.C., may be selected for advanced work by the professor of military science and tactics. Those who pursue the Advanced Course are required to sign an agreement with the government to continue the two years' course to completion. This includes attendance at a training camp, held normally during the summer following the first year's advanced work. The camp is conducted free of cost to the student, and in addition, while actually in camp, the student receives the pay prescribed for the seventh

grade in the army. Students pursuing the Advanced Course are also furnished a special uniform and receive a fixed allowance per day. The total government compensation for the two years' advanced work amounts to something over \$200. Students who satisfactorily complete the Advanced Course will be commissioned in the Officer's Reserve Corps of the United States Army.

The University allows 18 credits for the two years' Advanced Course, R.O.T.C., in all units except the Signal Corps, in which a total of 18 or 21 credits is allowed. These credits may be applied towards graduation.

The Advanced Course for the students of this college embraces three departments: Infantry, Coast (Anti-aircraft) Artillery, and Signal Corps. The Signal Corps is open to electrical engineers only.

1f-2w-3s—First Year Basic Course, R.O.T.C.

Infantry. Practical and theoretical instruction in infantry drill, rifle marksmanship, hygiene and first aid, physical training, military courtesy, infantry equipment and ceremonies. No cred.; no prereq.

Coast Artillery. Duties of the Coast Artillery soldier, military customs and methods. Practical study of one anti-aircraft gun and carriage. Instruction for second class gunner, Coast Artillery, with particular reference to anti-aircraft artillery. No cred.; no prereq.

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| 1f | (1) I MWF; A | (2) IX MWF; A |
| 2w | (1) I MWF; A | (2) IX MWF; A |
| 3s | (1) I MF, IX W; A | (3) II TTh, IX T; A |
| | (2) IX MTF; A | |

Signal Corps. The National Defense Act and the R.O.T.C., military courtesy and discipline, military hygiene and first aid, military wire system, drill and command, army organization. No cred.; no prereq.

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| 1f | (1) I MWF; A | (2) IX MWF; A |
| 2w | (1) I MWF; 321EE | (2) IX MWF; 321EE |
| 3s | (1) I MF, IX W; A | (2) IX MTF; A |

4f-5w-6s—Second Year Basic Course, R.O.T.C.

Infantry. Practical instruction in school of the platoon and company; command and leadership; scouting and patrolling; and automatic rifle; musketry; and interior guard duty. No cred.; prereq., 1-2-3.

Coast Artillery. Duties of non-commissioned officer of Coast Artillery; instruction for first class gunner, Coast Artillery Corps, with particular reference to anti-aircraft artillery. No cred.; prereq., 1-2-3.

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| 4f-5w | (1) I TThS; A | (2) II TThS; A |
| 6s | (1) I MF, IX W; A | (4) II TTh, IX T; A |
| | (2) I TTh, IX T; A | (5) IV MW, IX W; A (Agr. Engr. only) |
| | (3) I TTh, IX W; A | |

Signal Corps. Drill and command, radio code and radio procedure. No cred.; prereq., 1-2-3.

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| 4f | (1) III MWF; A | (3) IX MWF; A |
| | (2) VII MWF; A | |
| 5w | (1) III MWF; 321EE | (3) IX MWF; 321EE |
| | (2) VII MWF; 321EE | |
| 6s | (1) VII MW, IX, T; A | (2) III MW, IX W; A |

51f-52w-53s—First Year Advanced Course, R.O.T.C.

Infantry. Field engineering and combat principles; military sketching and

map reading; machine gun; and command and leadership. 3 cred. per qtr.; prereq., 4-5-6.

Coast Artillery. Duties of the Coast Artillery officer; guns; carriages and gunnery, analysis, instruction for expert gunner, with particular reference to anti-aircraft artillery. 3 cred. per qtr.; prereq., 4-5-6. Major Shippam.

51f-52w	Rec. (1) IV MWF; A	(2) II MWF; A
	Lab. (1) VIII-IX W; A	(2) VIII-IX M; A
53s	Rec. (1) IV MWF; A	(2) II MWF; A
	Lab. (1) IX W, I M or F; A	(4) IX W, I T or Th; A
	(2) IX T, IX M or F; A	(5) IX T, II T or Th; A
	(3) IX T, I T or Th; A	

Signal Corps. Map reading and sketching, Signal Corps tactics, drill and command, pistol and personal equipment, radio, etc. 3 cred. per qtr.; prereq., 4-5-6. Capt. Minckler.

51f IV MWF, I-II T; 321EE

52w VI MWF, I-II T; 321EE

53s Rec. VI-VII F

Lab. (1) I MF, IX W; A	(3) VII MW, IX T; A
(2) IX MTF; A	(4) III MW, IX W; A

54f-55w-56s—Second Year Advanced Course, R.O.T.C.

Infantry. 37 mm. gun; 3" trench mortar; administration; military history and National Defense Act; combat principles; military law; rules of land warfare; command and leadership. 3 cred. per qtr.; prereq. 51-52-53.

Coast Artillery. Duties of Coast Artillery officer; command and leadership. Military history, military law, orientation, field engineering. Motor transport, completion of student's military education in preparation for his duties as a second lieutenant. 3 cred. per qtr.; prereq., 51-52-53.

54f-55w	Rec. (1) I MWF; A	(2) III MWF; A
	Lab. (1) VIII-IX F; A	(2) VIII-IX W; A
56s	Rec. (1) I MWF; A	(2) III MWF; A
	Lab. (1) VIII-IX W; A	(4) IX W, I T or Th; A
	(2) IX T, IX M or F; A	(5) IX T, II T or Th; A
	(3) IX T, I T or Th; A	

Signal Corps. Military history and policy, administration and supply, military law, field engineering, drill and command. 1 cred. per qtr.; prereq., 51-52-53 and reg. E.E. 64-65-66 or 161-162-163.

54f-55w II ThF; 321EE

56s Rec. II Th; 321EE

Lab. (1) I MF, IX W; A	(3) VII MW, IX T; A
(2) IX MTF; A	(4) III MW, IX W; A

PHYSICAL EDUCATION FOR MEN

A physical examination is required of all new matriculants, and of all others using the department privileges, at the beginning of the year, and as often during their college course as their physical condition may indicate.

1f†-2w-3s*—Freshman Physical Education. Mass activities, corrective exercise, apparatus work, swimming, games, and efficiency test. Cred.‡; no prereq. Messrs, MacMillan, McKusick, Piper, and Thorpe.

- | | |
|--------------------|--------------------|
| (1) I MWF; 202S | (6) IV MWF; 202S |
| (2) II MWF; 202S | (7) VI MWF; 202S |
| (3) II TThS; 202S | (8) VII MWF; 202S |
| (4) III MWF; 202S | (9) VIII MWF; 202S |
| (5) III TThS; 202S | |

Note—Sections limited to 60 men.

7f-8w-9s—Advanced Leaders. One hour of instruction; two hours leading squads in Physical Education 1-2-3 or 16-17-18 under supervision. 1 cred. per qtr.; prereq., 1-2-3 or instructor's permission. Mr. Keller.

Lect. IV T; 206A

Lab. Ar

10f-11w-12s*—Minor Sports. Study of nature and function of play; use of leisure time; rules, theory, technique, and values of different sports. Fall: advanced swimming, indoor baseball. Winter: winter sports, wrestling, squash racquets. Spring; soccer, golf, handball. Lecture one hour, practice three hours. 2 cred. per qtr.; prereq., 1-2-3 or permission. Mr. Keller.

Lect. IV S; 206A

Lab. IV MWF; A

16f-17w-18s*—Drill Substitution. By petition in substitution for military science. Examiner, Dr. L. J. Cooke. No cred.; no prereq.

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|-------------------|--------------------|
| (1) I MWF; 264S | (5) VII MWF; 264S |
| (2) II MWF; 264S | (6) VIII MWF; 264S |
| (3) III MWF; 264S | (7) IX MWF; 264S |
| (4) IV MWF; 264S | |

30s*—Athletic Training and First Aid. Principles governing conditioning of men for various sports; diet, sleep, exercise, bathing, massage. Overtraining; its cause, diagnosis, prevention, and cure. Prevention and first aid treatment of common athletic injuries. 2 cred.; no prereq.; I MWF; 206A. Dr. Cooke.

PHYSICAL EDUCATION FOR WOMEN

This department aims to promote the physical efficiency of the women students. It gives physical examination and advice to all on entrance; plans systematically to keep in close touch with them during their first two years of residence; conducts yearly consultations with, and examines when necessary, all upper-class students; gives courses in hygiene; organizes neuro-muscular activity leading toward organic strength, nervous stability, conscious motor control, correct bodily mechanics, skill in handling the body in physical recreation, and the development of that valuable social quality known as good sportsmanship; cooperates closely with the Women's Athletic Association in encouraging and organizing athletic sports, holds regular office hours for the purpose of consultation with all students who desire its advice.

Work in this department is required of all newly entering students (see Courses 1-2-3) and of all sophomores, who are permitted as free a choice among

* A maximum gymnasium fee of \$1.50 is charged each quarter to students pursuing one or more of these courses.

† Course 1 may be offered as a substitute for Preventive Medicine 12s.

‡ Course 1-2-3 carries a total of three credits. The entire course must be completed before credit is received for any quarter.

Course 1f-2w-3s carries no credit when taken in place of military science and tactics by foreign students and others in the College of Engineering and Architecture.

the sophomore courses as their physical condition permits (see "sophomore" courses; students who cannot swim must register for Course 22-23 during sophomore years). Physical examination or consultations are required annually of all students.

Women students in the College of Engineering and Architecture and the School of Chemistry take physical education instead of military science and tactics in the freshman and sophomore years and without numerical credit.

STATEMENT OF FEES

Elementary physical training \$2.50 a quarter. All other exercise courses, including swimming, \$2 a quarter. Maximum fee paid by a student in physical education, \$3.50 a quarter.

1f-2w-3s—Freshman Physical Education. Apparatus and floor work, hygiene, orthopedic exercise, dancing, sports. Individual health consultations. No prereq. Required of all new students.

1f	Lect.	(1) I W; 201WGm	(5) IV M; 201WGm
		(2) II T; 201WGm	(6) IV T; 201WGm
		(3) II Th; 201WGm	(7) VI W; 201WGm
		(4) III Th; 201WGm	(8) VI Th; 201WGm
	Lab.	(1) II MWF; 3,151,153WGm	(4) IV MWF; 3,151,153WGm
		(2) III MWF; 3,151,153WGm	(5) VI MWF; 3,151,153WGm
		(3) III TThS; 3,151,153WGm	(6) VIII MWF; 3,151,153WGm
2w	Lab.	(1) II MWF; 3,151,153WGm	(4) IV MWF; 3,151,153WGm
		(2) III MWF; 3,151,153WGm	(5) VI MWF; 3,151,153WGm
		(3) III TThS; 3,151,153WGm	(6) VIII MWF; 3,151,153WGm
3s	Lab.	(1) II MWF; 3,151,153WGm	(4) IV MWF; 3,151,153WGm
		(2) III MWF; 3,151,153WGm	(5) VI MWF; 3,151,153WGm
		(3) III TThS; 3,151,153WGm	(6) VIII MWF; 3,151,153WGm

4s*—Preliminary Hygiene. For nurses and transfer students. No cred.; no prereq.; II T; 206Pt.

7f,8w‡—Sophomore Gymnastics. Gymnastics, apparatus, folk dancing, games. No cred.; prereq., 1-2-3; IV TS; 153WGm.

9s—Sophomore Archery. Suitable in strength for girls in Individual Gymnastics. No cred.; prereq., 1-2-3.

(1) II MW; 151WGm	(3) VII WF; 151WGm
(2) IV TS; 151WGm	

10f-11w-12s‡—Sophomore Orthopedic and Individual Gymnastics. For those who need more individual supervision than is possible in other classes. No cred.; prereq., 1-2-3. Dr. Tolg.

10f-11w (1) I WF; 3WGm	(3) VI TTh; 3WGm
(2) IV TS; 3WGm	
12s IV TS; 3WGm	

13f,s-14w-15s—Sophomore Interpretive Dancing. An art and a phase of physical education designed to develop a sense of beauty and body control through rhythmic movements prompted by the imagination. No cred.; prereq., 1-2-3 for 13, 13 for 14, 14 for 15.

13f (1) VI TTh; 151WGm	(2) II TTh; 151WGm
13s VI TTh; 151WGm	
14w VI TTh; 151WGm	
15s VI TTh; 151WGm	

* No fee is charged for this course.

‡ Students may enter course any quarter.

- 16f,17w—Sophomore Games and Folk Dancing. Conducted outdoors when weather permits. No cred.; prereq., 1-2-3; I WF; 151WGm. Miss Dickson.
- 18s—Tennis. No cred.; prereq., 1-2-3.
 (1) I TTh; 151WGm (4) VII WF; 151WGm
 (2) IV TS; 151WGm (5) VIII TTh; 151WGm
 (3) VI TTh; 151WGm
- 19f-20w-21s—Sophomore Major Sports. Hockey in autumn, basket-ball in winter, baseball in spring. Suitable in strength for A-B girls. No cred.; prereq., 1-2-3.
 19f (1) V MW; 151WGm (3) VIII TTh; 151WGm
 (2) VII WF; 151WGm
 20w (1) V MW; 151WG (3) VIII TTh; 151WGm
 (2) VII WF; 151WGm
 21s (1) V MW; 151WGm (2) VII WF; 151WGm
- 22f,w,s-23w§—Sophomore Elementary Swimming. 22, elementary; 23, low intermediate. No cred.; prereq., 1-2-3.
 22f,s-23w (1) II TTh; 51WGm (5) VII TTh; 51WGm
 (2) III MW; 51WGm (6) VIII (3:30) TTh; 51WGm
 (3) IV TS; 51WGm (7) VIII (4:00) TTh; 51WGm
 (4) IV MW; 51WGm
 22f,w,s VII WF; 51WGm
- 24f,s†—Sophomore Horseback Riding. Lessons for beginning and advanced classes under competent instruction, supervised by a member of the Department of Physical Education for Women. Miss Starr.
 (1) VIII TTh; ar (2) IX TTh; ar
- 25f,s-26w§—Sophomore Intermediate and Advanced Swimming. Wide range of strokes, elementary diving, water safety. No cred.; prereq., 1-2-3, elementary swimming test.
 (1) III TTh; 51WGm (3) VI MW; 51WGm
 (2) VIII (4:00) MW; 51WGm
- 27f,s‡—Sophomore Golf. The fall quarter is open to students who know the rudiments of golf, and the spring quarter is open only to beginners in golf. Miss Kissock.
 27f VI TTh; ar
 27s (1) I TTh; ar (3) II MW; ar
 (2) II TTh; ar
- 30s—Sophomore Life Saving and Water Sports. Red Cross life saving leading to membership in the Life Saving division of the American Red Cross. No cred.; soph., jr., sr.; prereq., 1-2-3, and adv. swimming test; IX MW; 51WGm. Miss Starr.
 (1) II TTh; ar (2) VII WF; ar
- 31w||—Sophomore Skating. Practice in technique of fundamental strokes. No cred.; prereq., 1-2-3.
- 32w—Sophomore Elementary Clog and Tap Dancing. Fundamental clog and tap steps and simple routines. No cred.; prereq., 1-2-3. VI TTh; 153WGm.

† Students registering for this course will pay for riding lessons at about \$1 per lesson, but not the regular physical education fee. Attendance at class hour is required for credit.

§ The winter quarter is not open to students who have not had the fall or spring quarters. No student may register for more than two quarters of swimming without permission. Course 22 is never closed to senior registration.

‡ Students must supply their own golf equipment. Golf course at University. Recreation field will be used for 27f. Student tickets, 10 for \$4.50. No gymnasium fee is charged for this course.

|| Class meetings will be fifty minutes in length, since weather and ice conditions will cause omission at times.

PHYSICS

3f,w,s,su—Elements of Mechanics. Mechanics of solids and fluids. Study of the simpler fundamental principles. First part of a general course 3, 9, 23, 33, 43. Course 4 should be taken in conjunction with this course. 3 cred.; prereq., M.&M. 12 or equiv. Mr. Erikson.

3f Lect. (1) II MWF; 150Ph
Quiz (1) II Th; 150Ph

(2) VI MWF; 150Ph
(2) IX Th; 150Ph

3w,s Lect. VIII MWF; 150Ph

Quiz IX F or ar; 150Ph

4f,w,s,su*—Elements of Mechanics Laboratory. The laboratory part supplementing Course 3. 1 cred.; prereq., 3 or reg. in 3. Mr. Erikson.

4f (1) VI-VII W; 153Ph
(2) VIII-IX F; 153Ph
(3) VIII-IX M; 153Ph
(4) I-II S; 153Ph
(5) I-II W; 153Ph
(6) I-II T; 153Ph
(7) I-II M; 153Ph

(8) VI-VII Th; 153Ph
(9) III-IV T; 153Ph
(10) VI-VII F; 153Ph
(11) VI-VII M; 153Ph
(12) I-II F; 153Ph
(13) III-IV S; 153Ph

4w,s (1) VI-VII M; 153Ph
(2) VIII-IX T; 153Ph

(3) I-II T; 153Ph
(4) VIII-IX Th; 153Ph

13w,s—Acoustics. Study of the principles and applications of sound. 3 cred.; prereq., 3; VIII MWF, IX T.; 166Ph. Mr. Buchta.

23f,w—Heat. Study of the principles underlying heat phenomena. Course 24 should be taken in conjunction with this course. 3 cred.; prereq., 3. Mr. Miller.

23f Lect. III TThS; 150Ph

Quiz IX T; 150Ph

23w Lect. (1) II MWF; 150Ph
(2) VI MWF; 150Ph

(3) IV MWF; 150Ph

Quiz (1) II Th; 150Ph

(2) IX Th; 150Ph

24f,w*—Heat Laboratory. Laboratory part supplementing Course 23. 1 cred.; prereq., 4, 23, or reg. in 23. Mr. Miller.

24f (1) VI-VII M; 244Ph
(2) VIII-IX M; 244Ph

(3) VI-VII T; 244Ph
(4) VIII-IX T; 244Ph

24w (1) VIII-IX M; 244Ph
(2) III-IV T; 244Ph
(3) VIII-IX T; 244Ph
(4) I-II S; 244Ph
(5) I-II M; 244Ph
(6) I-II T; 244Ph
(7) VI-VII M; 244Ph

(8) VIII-IX F; 244Ph
(9) VI-VII Th; 244Ph
(10) VI-VII W; 244Ph
(11) I-II W; 244Ph
(12) VI-VII F; 244Ph
(13) III-IV S; 244Ph

33f,w,s—Optics. Experimental demonstrations of optical phenomena and a study of the fundamental optical principles. Course 34 should be taken in conjunction with this course. 3 cred.; prereq., 3.

33f Lect. (1) I TThS; 133Ph
(2) IV MWF; 133Ph

Quiz IX F; 133Ph

33w Lect. I TThS; 133Ph

Quiz VIII Th; 133Ph

33s Lect I TThS; 133Ph

Quiz IX T; 133Ph

34f,w,s*—Optics Laboratory. Laboratory part supplementing Course 33. 1 cred.; prereq., 33 or reg. in 33. Mr. Valasek and others.

34f,s (1) VI-VII M; 352Ph
(2) VIII-IX M; 352Ph

(3) VI-VII Th; 352Ph
(4) VI-VII F; 352Ph

34w (1) VIII-IX M; 352Ph

(2) VI-VII F; 352Ph

* A laboratory fee of \$2 is charged for each of these courses.

43w,s—Electricity. Study of the principles underlying electric phenomena. Course 44 should be taken in conjunction with this course. 3 cred.; prereq., 3. Mr. Zeleny.

43w	Lect. III TThS; 166Ph	Quiz IX T; 150Ph
43s	Lect. (1) II MWF; 150Ph (2) VI MWF; 150Ph	(3) IV MWF; 150Ph
	Quiz (1) II Th; 150Ph	(2) IX Th; 150Ph

44w,s*—Electricity Laboratory. Laboratory part supplementing Course 43. 1 cred.; prereq., 4, 43, or reg. in 43. Mr. Zeleny.

44w	(1) VI-VII T; 231Ph (2) VIII-IX T; 231Ph	(3) VI-VII W; 231Ph
44s	(1) VIII-IX F; 231Ph (2) III-IV T; 231Ph (3) I-II S; 231Ph (4) III-IV M; 231Ph (5) I-II W; 231Ph (6) III-IV F; 231Ph (7) I-II M; 231Ph (8) II-III Th; 231Ph	(9) VI-VII F; 231Ph (10) VI-VII Th; 231Ph (11) VI-VII W; 231Ph (12) III-IV S; 231Ph (13) I-II F; 231Ph (14) VIII-IX M; 231Ph (15) VIII-IX Th; 231Ph (16) III-IV W; 231Ph

123s—Pyrometry and Heat. Experimental study of pyrometry, heat transfer, hygrometry, and gas liquefaction. One lecture, two three-hour sessions in the laboratory a week. 3 cred.; prereq., 23, 24; VI-IX MW, or ar.; 245Ph. Mr. Miller.

144f*—Electricity Measurements. Devoted mainly to the study of potentiometer methods, capacitance, inductance, magnetic flux. One lecture, one quiz hour and two two-hour laboratory periods a week. 3 cred.; prereq., 43, 44. Mr. Zeleny.

	Lect. II Th; 166Ph	Quiz V M; 166Ph
Lab.	(1) VI-VII TTh; 231Ph (2) VIII-X T, III-IV S; 231Ph (3) III-IV T, VIII-IX Th; 231Ph	(4) VI-VII W, I-II S; 231Ph (5) VIII-IX M, VI-VIII F; 231Ph

For other electives in the Department of Physics see the bulletin of the College of Science, Literature, and the Arts.

PHYSIOLOGIC CHEMISTRY

100f,su—Physiologic Chemistry. Chiefly in organic aspects. Metabolism of proteins, fats, carbohydrates in health and disease. 5 cred.; prereq., physics and Organic Chemistry 53. Messrs. McClendon, Hemmingway, and Cavett.

Lect.	IV TS, III Th; BotAud	Lab. VI-VIII TTh; 310MH
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101s,su—Physiologic Chemistry. Application of physical chemistry to physiology. 5 cred.; prereq., Physiology 100 and physical chemistry. Mr. McClendon.

Lect.	IV TS, VI F; BotAud	
Lab.	(1) VII-IX Th; 310MH	(2) VI-VIII T; 310MH

PREVENTIVE MEDICINE AND PUBLIC HEALTH

3f,w,s—Personal Hygiene and Elementary Sanitation. 2 cred.; no prereq. Drs. Hinckley, Hesdorffer, and Watson.

(1) IV TS	(2) IX TTh
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12s—Hygiene and First Aid. Required of all male freshmen in Engineering, Architecture, and Chemistry. No cred.; no prereq. Dr. Boardman.

(1) VII T; 305E	(2) IX F; 305E
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* A laboratory fee of \$2 is charged for each of these courses.

- 50f,w,s—Public and Personal Health. 3 cred.; prereq., jr., sr.; V MWF. Dr. O'Brien.
- 53f,s,su—Elements of Preventive Medicine. 3 cred.; prereq., Psy. 1-2, Bact. 51 or equiv., or by permission; II MWF. Dr. Diehl.
- 73w—Occupational Hygiene and Disease. 2 cred.; prereq., 53; IV MW. Dr. Myers.

NOTE.—Classroom schedule for courses in Preventive Medicine and Public Health will be posted on bulletin board in Millard Hall and published in the *Minnesota Daily* at the beginning of each quarter.

RHETORIC

(College of Agriculture)

- 22f,w,s—Public Speaking. Practical course in fundamentals of speech making. 3 cred.; prereq., 6. Mr. Routledge.
- 22f,s III MWF; 311En(UF)
22w (1) I MWF; 311En(UF) (2) II MWF; 311En(UF)
- 23f,w,s—Public Speaking. 5 cred.; prereq., 6; IV MTWFS; 311En(UF).

SOILS

- 6w—Soils. Origin, formation, physical properties, moisture, relations, principles of soil fertility, use of lime, commercial fertilizers, and stable manure; soil organisms and green manures; tillage. 5 cred.; no prereq.; II MTWThF; 204So. Messrs. A'way and Rost.
- 108w—Physical Properties of Soils. The determination of physical constants of soils, including mechanical composition. 3 cred.; jr., sr.; prereq., 6. Mr. McMiller.
- Lect. VI W; 204So
Lab. (1) VII-IX W; 201So (2) VI-VIII F; 201So

SPEECH

- 35w,s—Fundamentals of Speech. Study of speech as applied in the social adaptation of the individual and in his control of his environment. Emotional problems. Technique of thought. Oral reading and original speeches. 3 cred.; prereq., Engl. 6; I MWF; 335EE. Mr. Ramsland.

ZOOLOGY

- 14f-15w-16s*†—General Zoology. Structure, physiology, embryology, classification, and evolution of animals. Textbook, lectures, laboratory, and quizzes. 9 cred.; no prereq.; VI-VIII TTh; 101Z, 313Z. Mr. Dawson.

* A laboratory fee of \$1 is charged each quarter.

† The entire course must be completed before credit is received for any quarter.

The Bulletin
of the University of
Minnesota

The Graduate School
Announcement for the Years
1931-1933



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1931							1932													
JULY							JANUARY							JULY						
Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa
..	..	..	1	2	3	4	..	..	..	..	..	1	2	..	..	..	..	..	1	2
5	6	7	8	9	10	11	3	4	5	6	7	8	9	3	4	5	6	7	8	9
12	13	14	15	16	17	18	10	11	12	13	14	15	16	10	11	12	13	14	15	16
19	20	21	22	23	24	25	17	18	19	20	21	22	23	17	18	19	20	21	22	23
26	27	28	29	30	31	..	24	25	26	27	28	29	30	24	25	26	27	28	29	30
..	..	..	..	..	..	..	31	..	..	..	..	..	..	31	..	..	..	..	..	..
AUGUST							FEBRUARY							AUGUST						
..	..	..	..	..	..	1	..	1	2	3	4	5	6	..	1	2	3	4	5	6
2	3	4	5	6	7	8	7	8	9	10	11	12	13	7	8	9	10	11	12	13
9	10	11	12	13	14	15	14	15	16	17	18	19	20	14	15	16	17	18	19	20
16	17	18	19	20	21	22	21	22	23	24	25	26	27	21	22	23	24	25	26	27
23	24	25	26	27	28	29	28	29	..	..	..	..	..	28	29	30	31	..	..	..
30	31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
SEPTEMBER							MARCH							SEPTEMBER						
..	..	1	2	3	4	5	..	..	1	2	3	4	5	..	..	..	..	1	2	3
6	7	8	9	10	11	12	6	7	8	9	10	11	12	4	5	6	7	8	9	10
13	14	15	16	17	18	19	13	14	15	16	17	18	19	11	12	13	14	15	16	17
20	21	22	23	24	25	26	20	21	22	23	24	25	26	18	19	20	21	22	23	24
27	28	29	30	..	..	..	27	28	29	30	31	..	..	25	26	27	28	29	30	..
..
OCTOBER							APRIL							OCTOBER						
..	..	..	1	2	3	4	..	..	..	..	1	2	..	..	..	..	..	1	2	
5	6	7	8	9	10	11	3	4	5	6	7	8	9	2	3	4	5	6	7	8
12	13	14	15	16	17	18	10	11	12	13	14	15	16	9	10	11	12	13	14	15
19	20	21	22	23	24	25	17	18	19	20	21	22	23	16	17	18	19	20	21	22
26	27	28	29	30	31	..	24	25	26	27	28	29	30	23	24	25	26	27	28	29
..	..	..	..	..	..	..	..	..	..	..	..	..	..	30	31	..	..	..	..	..
NOVEMBER							MAY							NOVEMBER						
1	2	3	4	5	6	7	1	2	3	4	5	6	7	..	..	1	2	3	4	5
8	9	10	11	12	13	14	8	9	10	11	12	13	14	6	7	8	9	10	11	12
15	16	17	18	19	20	21	15	16	17	18	19	20	21	13	14	15	16	17	18	19
22	23	24	25	26	27	28	22	23	24	25	26	27	28	20	21	22	23	24	25	26
29	30	..	..	..	..	..	29	30	31	..	..	..	..	27	28	29	30	..	..	..
..
DECEMBER							JUNE							DECEMBER						
..	..	1	2	3	4	5	..	..	..	1	2	3	4	..	..	..	..	1	2	3
6	7	8	9	10	11	12	5	6	7	8	9	10	11	4	5	6	7	8	9	10
13	14	15	16	17	18	19	12	13	14	15	16	17	18	11	12	13	14	15	16	17
20	21	22	23	24	25	26	19	20	21	22	23	24	25	18	19	20	21	22	23	24
27	28	29	30	31	26	27	28	29	30	25	26	27	28	29	30	31
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UNIVERSITY CALENDAR

1931-32

1931			
September	22-Oct. 10		Registration of graduate students
September	28 Monday		Fall quarter classes begin, 8:30* a.m.
October	8 Thursday		Examinations in German and French for candidates for advanced degrees
November	5 Thursday		Last day for filing theses of candidates for the Ph.D. degree for the fall quarter
November	14 Saturday		Last day for filing subject-matter of Master's thesis for the spring quarter
November	19 Thursday		Last day for filing theses of candidates for Master's degrees for the fall quarter
December	17 Thursday		Commencement Convocation
December	19 Saturday		Fall quarter ends, Christmas vacation begins, 5:20 p.m.
1932			
January	4 Monday		Christmas vacation ends, winter quarter begins, 8:30* a.m.
January	14 Thursday		Examinations in German and French for candidates for advanced degrees
February	4 Thursday		Last day for filing theses of candidates for the Ph.D. degree for the winter quarter
February	18 Thursday		Last day for filing theses of candidates for Master's degrees for the winter quarter
March	17 Thursday		Commencement Convocation
March	19 Saturday		Winter quarter ends, spring vacation begins, 5:20 p.m.
March	28 Monday		Spring vacation ends, spring quarter begins, 8:30* a.m.
April	7 Thursday		Examinations in German and French for candidates for advanced degrees
April	25 Thursday		Last day for filing theses of candidates for the Ph.D. degree in June
May	9 Monday		Last day for filing theses of candidates for Master's degrees for June
June	6 Monday		Sixtieth annual commencement
June	11 Saturday		Spring quarter closes
June	15 Wednesday		Summer quarter, first term begins
June	21 Thursday		Commencement Convocation
June	23 Thursday		Last day for filing theses of candidates for advanced degrees for first term of summer quarter
July	21 Thursday		Commencement Convocation
July	25 Monday		Summer quarter, second term begins
August	27 Saturday		Summer quarter, second term closes

* First hour classes begin at 8:15 at University Farm.

THE GRADUATE SCHOOL

ORGANIZATION

The Graduate School has exclusive control of all graduate work carried on in the University. The graduate faculty is composed of those properly approved and qualified to offer courses carrying graduate credit. It determines the general educational policy of the Graduate School, and recommends candidates for degrees. The administration of the Graduate School is committed to the dean and an executive committee of seven members. They are assisted by group committees representing allied lines of work grouped together for administrative purposes. The groups are as follows:

- a. Social Sciences and Law
- b. Physical Sciences, Mathematics, and Engineering
- c. Biological Sciences
- d. Philosophy, Psychology, and Education
- e. Language and Literature
- f. Medicine
- g. Agriculture

ADMISSION

Any graduate holding a Bachelor's degree or its equivalent from a reputable college or university who has made a satisfactory record in his college course or who has shown special aptitude in some field of study will be admitted to the Graduate School, and may register for such graduate work as he may be found prepared to enter upon.

All inquiries concerning admission to the Graduate School should be addressed to the dean. The student should obtain and fill out an application for admission before presenting himself for registration and accompany this with an official transcript of his college record.

If the rating of the institution from which he received his first degree is such that he will need additional work before beginning graduate work at the University of Minnesota, he is advised to enter one of the undergraduate colleges of the University and obtain the preliminary training and an acceptable Bachelor's degree.

College graduates who simply desire to take additional work of undergraduate grade without a view to preparation for an advanced degree should register as unclassified students in the college giving the work.

Advanced standing may be granted for work done in other approved graduate schools. Credits for advanced courses earned while the student is registered in an undergraduate college, even if in excess of the credits required for the baccalaureate degree, cannot be transferred to the Graduate School. In exceptional cases, with permission of the dean of the undergraduate college concerned and of the dean of the Graduate School, undergraduates lacking not more than 9 quarter credits may be permitted to

register also in the Graduate School for partial credit. No transfer of graduate credits will modify the minimum requirements of one academic year in residence as a graduate student in this University for those who are candidates for an advanced degree.

REGISTRATION

Full directions concerning registration will be found in a booklet issued by the registrar's office for the information of new students. The essential document is an official transcript of the student's college record.

FEEES

	Quarter
Tuition fee for residents (except for clinical medicine).....	\$20.00
Tuition fee for non-residents.....	30.00
Credit hour tuition for students carrying less than full work	
Residents	1.75
Non-residents	2.50
Matriculation deposit (first quarter in residence).....	3.00
Special deposit for Chemistry laboratory.....	5.00

Voted to approve effective, beginning with the academic year 1929-30, a fee of \$60 plus the established graduation fee for the professional degrees in engineering, architecture, and chemistry for work done in absentia.

Registration in the Graduate School includes the making out of the program which must be approved by a departmental adviser and the dean.

Fees must be paid not later than one week following the approval of the registration by the dean of the Graduate School in order to avoid a \$2 penalty fee.

All the fees above mentioned apply to the regular session. For the summer quarter fees, see special bulletin.

FELLOWSHIPS AND SCHOLARSHIPS

Four graduate fellowships have been established by the late Thomas H. Shevlin, of Minneapolis. These are awarded one each in the College of Agriculture, Forestry, and Home Economics, the School of Chemistry, the Medical School, and the College of Science, Literature, and the Arts. Each fellowship yields \$500 per annum. They are awarded annually. Candidates for these fellowships should file their applications before March 1 with the dean of the Graduate School.

Shevlin fellows will devote their entire time to the graduate work for which they are registered, and may not engage in private tutoring or be required to render any service to the University.

CALEB DORR RESEARCH FELLOWSHIP IN AGRICULTURE, FORESTRY, AND HOME ECONOMICS

By request of the late Caleb Dorr, of Minneapolis, the income from twenty thousand dollars is available for graduate fellowships in the Department of Agriculture of the University of Minnesota. Usually three fellowships of \$500 each will be awarded each year. The holders of these fellowships are exempt from all tuition fees. The basis of the award is scholarship and the prospect and promise of productive research.

Caleb Dorr fellows will devote their entire time during the academic year (nine months) to the graduate work for which they are registered and may not engage in private tutoring or be required to render any service to the University.

Candidates for these fellowships should file their applications before March 1 with the dean of the Graduate School. Application blanks may be secured from the dean of the Graduate School or from the dean of the College of Agriculture, Forestry, and Home Economics.

THE DUPONT FELLOWSHIP IN CHEMISTRY

This fellowship, established by E. I. duPont de Nemours and Company, yields \$750 annually. The holder devotes his entire time to graduate study and is not required to render any service to the University.

THE ALBERT HOWARD SCHOLARSHIP

This scholarship, founded by Mr. James T. Howard, yields \$240 annually. The holder is expected to do graduate work in liberal arts.

THE CLASS OF 1890 FELLOWSHIP

On the twenty-fifth anniversary of its graduation the class of 1890 founded a fellowship yielding \$200 and exemption from tuition. This fellowship is open to graduates of the Colleges of Science, Literature, and the Arts, and Engineering and Architecture desiring to pursue advanced work. Applications should be filed with the dean of the Graduate School before March 1.

CLARA UELAND FELLOWSHIP

The income from \$11,191.67 is awarded annually to a recent woman graduate of any acceptable college or university for graduate study of problems of government and citizenship. Recipient is exempt from tuition fees.

HONORARY FELLOWSHIPS FOR VISITING SCHOLARS

Professors or other eminent scholars from other institutions, who may desire temporarily the privileges of the library, research facilities, and seminars in the University, and who are not candidates for a degree, may upon recommendation of the dean of the Graduate School and the approval of the president of the University be appointed as honorary fellows without stipend.

Honorary fellows shall not be required to pay any fees except to cover the cost of unusually expensive supplies or equipment.

DEPARTMENTAL SCHOLARSHIPS

Besides the above stipends there are numerous assistantships with varying stipends assigned to various departments, and exemption from tuition and fees in the Graduate School. The amount of graduate work that can be carried is proportioned to the service burden of the assistantships.

Inquiries and requests for application blanks may be addressed to the dean of the Graduate School, or to the head of the department in question.

GRADUATE WORK IN THE SUMMER QUARTER

Work of graduate character done in the summer quarter of the University of Minnesota may be counted for residence credit for advanced degrees. In exceptional cases, the course work for the Master's degree may be completed in four summer terms of six weeks each, or in three full summer quarters. In the first case, the candidate may be permitted to carry *in absentia* thesis work to complete the equivalent of three quarters. Students working for the Master's degree in summer terms or quarters must file the subjects of their theses before the completion of the first half of the required work. Theses of summer quarter students must be completed at least four weeks before the end of the session in which they take the degree.

An increasing amount of graduate work in fields of interest to high school teachers is being offered in the summer quarter. The courses for any session may be found in the bulletin of the summer quarter.

Students who desire graduate credit for work in the summer must register through the office of the Graduate School.

GRADUATE WORK IN MEDICINE

Graduate work in the laboratory departments and in the clinical branches leading to advanced degrees is offered by the University of Minnesota. This work is under the direction of the Graduate School, and candidates for admission and degrees must meet the requirements of the Graduate School as outlined in the preceding pages. The work is offered by members of the medical faculty in Minneapolis and by members of the graduate faculty on the Mayo Foundation at Rochester, Minnesota, where part or all the residence work may be done. Several teaching fellowships supported by the University and others on the Mayo Foundation are open to qualified students pursuing graduate work in clinical medicine or in the laboratory branches. A special bulletin on graduate work in medicine is published and may be obtained from the registrar.

GRADUATE WORK BY UNDERGRADUATES

1. No graduate credit allowed for any courses taken without previous arrangement by petition with the Graduate School.
2. No credit is possible for courses taken by undergraduates who lack more than 9 quarter credits toward the Bachelor's degree.
3. If not more than 9 quarter credits of undergraduate credit are lacking, petition may be filed to carry a limited amount of graduate work (approved courses above 100) for graduate course credit, such courses not to be applied toward an undergraduate degree.
4. With permission of the dean of the undergraduate college concerned, undergraduates lacking not more than 6 quarter credits may be permitted to register also in the Graduate School. This will be permitted in exceptional cases only.

GRADUATE WORK IN LAW

Under certain properly approved conditions graduate students may offer courses in law as a minor for an advanced degree when their major work is in the Department of Political Science or Economics.

A course leading to the degree of master of laws may be taken under the direction of the Graduate School of the University. Candidates must have completed two years of college work, and the work required for the first law degree in a school which is a member of the Association of American Law Schools. No specific course of study is required, but the course elected must be approved by an adviser. Subjects in the curriculum of the Law School not counted towards the first degree may be elected and additional work in subjects already studied. The candidate may also elect studies in the social sciences in the College of Science, Literature, and the Arts, and in the School of Business Administration. The candidate must complete eight year hours of classroom work and prepare a thesis that will be accepted for publication in the *Minnesota Law Review*. The course may be shaped to secure a more extensive survey of the law and related subjects, or to give a more thoro training in some special branch.

GRADUATE MEDICAL SOCIAL WORK

A course in medical social work leading to the degree of master of arts in sociology may be taken under the direction of the Graduate School of the University. Candidates must hold a Bachelor's degree from a reputable college or university. Students who have not had adequate preparation in their chosen field will require more than one year to attain the Master's degree. For prerequisites, see page 127. Graduate students holding Bachelor's degrees will find it practically necessary to have taken these courses, or take them here. The courses elected within the major subject of sociology and social work must be approved by the adviser, as must the choice of a minor, such as Public Health and Preventive Medicine, Psychology, or Child Welfare. The student must prepare a thesis which will fulfill the Graduate School requirements hereinafter set forth. The field work courses, which are a necessary part of the preparation for a Master's degree in this field, will be given in the Minneapolis General Hospital, and the University Hospital, Minneapolis, the Wilder Dispensary, St. Paul, and the Mayo Clinic, Rochester, Minn. The Mayo Foundation offers several fellowships to qualified students who have completed one quarter of satisfactory work at the University.

MASTER OF SCIENCE IN PSYCHOMETRICS

The degree of master of science in psychometrics is awarded to candidates who complete a special curriculum in the technique of psychological examining. This curriculum, while conforming to the general requirements for the Master's degree, provides for the distribution of work, with certain options, among courses in the Departments of Psychology, Educa-

tional Psychology, Sociology, and Child Welfare. One or more advisers will be designated in each of these departments to direct the work of candidates for this degree. These advisers should be consulted with reference to the details of the curriculum and the opportunities it offers to the student who proposes to become a psychological examiner in schools, personnel work, courts, welfare work, etc.

REQUIREMENTS FOR THE MASTER'S DEGREE

The degree of master of arts is, in general, conferred for advanced non-technical study; the degree of master of science, for advanced technical study, such as agriculture, industrial chemistry, engineering, etc.

The requirements for the degree of master of arts or master of science are covered in general by the statement that these degrees may be earned by properly qualified students only by at least one full academic year's work (three quarters) in residence at this University. Students who have not had adequate preparation in the specific chosen field of work, or who are doing outside work in excess of ten hours a week, will require more than one year to attain the Master's degree.

Upon entrance to the Graduate School, the candidate, with the approval of the dean, will select his adviser in the field of his major work. With the approval of his adviser and the dean, he will also select a minor, and will outline a study program for the year.

PROGRAM OF STUDY

A full program for a student who expects to meet the requirements in one academic year must cover the necessary courses in the fields of the major and minor and the preparation of a satisfactory thesis. The work must be selected from graduate courses offered in this bulletin and must amount to not less than 6 nor more than 9 credit hours each quarter. In addition, thesis work (or courses upon which the thesis is based) should be carried to make a total of not less than 15 hours per week for three quarters. In general, 9 quarter credits in the minor and 18 quarter credits in the major, in addition to the thesis (or courses upon which the thesis is based), is regarded as the minimum program for the Master's degree.

In all courses open to graduates only the student must secure a mark of "Pass." This will be interpreted as the instructor's approval upon the quality of the student's work viewed from the level upon which real graduate work is supposed to be carried on. In the courses open to both graduates and undergraduates the system of marking by letters may be continued for the present. A grade of not less than B must be obtained in any course of this character offered as fulfilling the requirements in the major. A grade of not less than C must be obtained in minor courses.

THE MAJOR

The major work must be in a department in which the candidate has had at least three years of work (18 semester or 27 quarter credits) if it be a department open to freshmen, or two years of work (12 semester or

18 quarter credits) if it be a department not open to freshmen. Part or all of this preliminary work may consist of designated prerequisite courses in the same or allied departments. Any special requirements will be noted in the corresponding departmental statement. At the end of the year, a final written examination (in addition to the usual course examinations) will be given in the major as noted below.

THE MINOR

The minor subject must be selected in a department in which the candidate has had at least one year's work (6 semester or 9 quarter credits), or he must have had in a closely allied department a year's work (6 semester or 9 quarter credits), which is actually designated as a prerequisite to the minor subject. Any special requirements will be noted in the corresponding departmental statements.

The choice of the minor must be in a department whose work can be logically related to that of the department in which the student is doing his major work. The dean and the group committee may in exceptional cases allow the minor subject to be taken in the same department as that of the major.

LANGUAGE REQUIREMENT

A reading knowledge of a foreign language, modern or ancient, the language to be determined by the major department, is required of candidates for the Master's degree, unless exemption is made in individual cases with the approval of the Executive Committee of the Graduate School. When no other statement is made in the departmental announcement in this bulletin, a knowledge of either French or German is expected. The candidate shall present to the dean of the Graduate School, not later than the close of the second quarter of residence, a certificate of proficiency in the designated language, signed by the professor in charge of the corresponding language department or his representative.

Candidates for the Master's degree in any department in the language and literature group will be required to have a reading knowledge of two foreign languages before they are recommended for the degree.

All examinations to meet the language requirement of the Graduate School, unless otherwise arranged with the language departments, shall be held on the days specified in the calendar at the beginning of this bulletin.

A candidate who fails in a language examination for an advanced degree shall not be given a second examination until the following quarter.

MASTER'S THESIS

Before the middle of the first quarter in residence the candidate shall file at the office of the Graduate School the subject of his thesis. This subject must be approved by his adviser and by the corresponding group committee. It should be on a topic falling within the field of the major. The candidate will ordinarily devote approximately one-half his time to the preparation of the thesis, including courses on which the thesis is based. The thesis must be written in acceptable English and show ability to work

independently, and give evidence of power of independent thought both in perceiving problems and making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

The thesis is required to be in quadruplicate in order to facilitate its consideration. Two copies are retained for the University Library (as noted below), the third copy being finally returned to the candidate. The fourth copy is necessary in cases where the department or adviser desires to retain a copy. Since one copy is usually desired by the adviser or department concerned, a fourth copy should be provided for this purpose. One copy must be upon the specially required red-ruled twenty-pound linen stock of 60 or 70 per cent rag content and the others may be carbon copies on bond paper. The original and first copy must contain all illustrative material. Ample margin should be left for binding purposes. Samples in the dean's office of both the linen stock and carbon paper should be examined before the thesis is typewritten. The body of the thesis should be double spaced, but footnotes may be single spaced.

The thesis must be finished and four copies deposited in the office of the dean of the Graduate School at least four weeks before the candidate presents himself for his degree.

The thesis will be examined by a committee of three, appointed by the dean on the recommendation of the group committee. The student's adviser will, as a rule, be the chairman of this committee. Unanimous approval by this committee will be necessary for the acceptance of the thesis.

If the thesis is accepted, the candidate must deposit with the registrar, at least one week before commencement, the sum of one dollar and fifty cents for binding the two copies of this thesis, which will be cataloged and deposited in the University Library. This copy cannot be taken from the library. The second copy, however, may be borrowed from the library.

EXAMINATIONS

All candidates for the M.A. degree will meet the regular requirements as to examinations, topics, reports, etc., of the classes in which they are registered. A special examination in the field of the minor is not required, but this does not excuse the candidate from the regular course examinations. Besides the usual course examinations, where such are given, the candidate for the Master's degree must pass a final written examination in the major and after acceptance of the thesis, a final oral examination.

The final written examination will be held not later than two weeks before the end of the quarter in which he takes his degree. It will cover the work of the candidate in the field of the major, and may include any work fundamental thereto. This examination will be held by his instructors in the major department, the adviser acting as chairman.

If the final written examination is satisfactory, and the thesis accepted, the final oral examination of the candidate will be held, not later than two weeks before the end of the quarter in which he takes his degree. The adviser will act as chairman of the examining committee, which will include

THE GRADUATE SCHOOL

all the instructors with whom the candidate has taken work, the thesis committee, and, ex-officio, the head or chairman of the department in which the major work is done. Any member of the graduate faculty may attend as a visitor. The final oral examination will cover all the work offered for the degree, and may include other work fundamental thereto. At the close of the examination, the committee will vote upon the candidate, taking into account all of his work. A majority vote is required for approval.

TABULAR SUMMARY OF REQUIREMENTS FOR
THE MASTER'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
Program, major and minor	Adviser and dean of the Graduate School	On entrance
Approval of thesis subject	Adviser and group committee	Middle of first quarter in residence
Language requirement	Adviser and language department	Before close of second quarter
Approval of candidacy	Executive committee	Beginning of third quarter
Filing of thesis	Dean of the Graduate School	At least six weeks before graduation
Examination of thesis	Thesis committee	Before admission to final oral examination
Final written examination in major	Major department members of the graduate faculty	Not later than four weeks before commencement and before final oral examination
Final oral examination on all work	Thesis committee; all candidate's instructors; head of major department	Not later than two weeks before commencement
(Course examinations as required at the usual times)		
Fee for binding thesis	Registrar	One week before commencement

Candidates who are eligible for the "preliminary examination" for the Doctor's degree may substitute this examination for the final oral examination for the Master's degree, provided that all other requirements for the preliminary examination (see p. 18) have been met.

Reports.—Special blanks are provided for signed reports concerning the thesis and the final oral examinations. All reports must be filed in the office of the dean of the Graduate School at least one week before the end of the last quarter.

Candidates meeting the requirements as above outlined will be reported by the dean to the executive committee of the graduate faculty, who will by vote recommend to the Board of Regents those approved for degrees.

Candidates upon whom degrees are to be conferred are required to be present at commencement unless especially excused by the dean of the Graduate School and the president of the University.

MASTER OF SCIENCE IN ENGINEERING OR ARCHITECTURE

The requirements and procedure for the degree of master of science in civil, mechanical, electrical, chemical, or architectural engineering or architecture will correspond to those outlined for this degree in other subjects. The major subject and thesis will lie in the field represented by the degree. The thesis will be filed and final written examination taken at least six weeks before graduation. The language requirement will be waived in all of these cases except chemical engineering, in which German is required.

THE ENGINEER DEGREES

REQUIREMENTS

The advanced professional degrees, civil engineer, mechanical engineer, electrical engineer, chemical engineer, and architectural engineer will be conferred upon the recommendation of the Graduate School faculty as a result of the satisfactory completion of the following requirements:

a. Bachelor's degree, from an approved school in the corresponding branch of engineering.

b. One full academic year of graduate engineering study (three quarters) in residence at this University. Graduates of this University may be permitted to carry on this study *in absentia* under the direction of the faculty. Work done *in absentia* may not be substituted for the residence work required for the master of science.

c. Four years in engineering experience in positions of responsibility, subsequent to receiving the Bachelor's degree. (If the graduate study is done *in absentia*, five years of experience are required.)

d. A thesis of professional grade.

Candidates for the degree of chemical engineer must have a reading knowledge of German.

For graduates of this University, a Master's degree in the corresponding branch of engineering will be accepted as fulfilling the requirements of the year of graduate study.

The Engineer degree will not be granted in less than five years after the Bachelor's degree was received.

If the Bachelor's degree is in another branch of engineering than that in which the professional degree is sought, the student must complete the equivalent of the subjects required for the Bachelor's degree in the new field before admission to candidacy for the desired degree.

MASTER'S DEGREE WITH THE ENGINEER DEGREE

It is recommended that the student who is entering upon the graduate year's study in residence for the Engineer degree register for and obtain the Master's degree for this year's work, that is, the degree of master of science in the corresponding branch of engineering. The essential difference lies in the requirement of a thesis if the Master's degree is sought. However, the aggregate amount of work is intended to be the same in both cases, namely, from 15 to 18 credit hours per week for the three quarters. If the graduate study does not lead to the Master's degree, the student is not required to prepare a thesis as a part of the year's work. The Master's thesis, however, will not satisfy the requirement for the professional thesis which is intended to be related to the practical experience after the Bachelor's degree was received.

PLAN OF STUDY

Upon entrance to the Graduate School, the candidate, with the approval of the dean, will select his adviser in the field represented by the desired degree, in which field the major work and the thesis, if one be taken, will lie. With the approval of his adviser and the dean, he will also select a minor, and will outline a study program for the year.

If the student registers for the Master's degree in engineering or architecture, he will conform to the requirements for that degree as regards major and minor work, thesis, examinations, etc.

If the graduate study during the year of residence or *in absentia* is towards the Engineer's degree only, it will be divided into major and minor work, of which the major will usually constitute about two thirds and the minor one third of the total of 12 to 15 credit hours which will be carried each quarter.

STUDY IN ABSENTIA

Only graduates of this University will be permitted to undertake the graduate study *in absentia* towards one of the Engineer degrees. This permission must be obtained from the head of the department represented by the degree, who will usually act as the adviser, and from the dean of the Graduate School. It is not necessary that this study be coincident with the academic year; it may be undertaken at any time.

The proposed plan of study should be arranged with the approval of the adviser. A flat fee of sixty dollars must be paid in advance. The study may, and generally will, extend over more than nine months. There is also the usual graduation fee of ten dollars. At least 1,500 actual hours of work should be performed as the equivalent of a year's study in residence.

The detailed requirements of reports and examinations will be established by the adviser. A separate written report must be submitted at the end of each quarter's work. A written examination covering the entire study, both major and minor, will be held at the close of the year's work. Under favorable circumstances this examination may be held in the place where the candidate resides.

Upon the satisfactory completion of the year's work, the proper credits will be recorded toward the engineering degree.

FEEES

A fee of \$60 is required for the year of graduate study towards the professional engineer degrees in engineering, architecture, and chemistry *if taken in absentia*. This is in addition to the regular graduation fee of \$10 paid at the time of qualifying for the degree.

STUDY IN RESIDENCE

The work will consist of regular courses offered in this bulletin and may include research if desired by the student, even tho the Master's degree be not sought.

THESIS

At least six months before the graduate degree is expected, the thesis subject must be approved by the adviser and the group committee. The thesis itself must be filed with the dean at least six weeks before the commencement at which the degree is to be obtained together with a deposit of one dollar and fifty cents to cover binding the thesis.

STATEMENT OF EXPERIENCE

With the thesis, the candidate must file a detailed statement of his professional experience since receiving his Bachelor's degree. This should amount to at least four years, if the graduate study was in residence, or five, if *in absentia*.

TABULAR SUMMARY OF REQUIREMENTS FOR THE ENGINEER'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
Program, major and minor	Adviser and dean of the Graduate School	On registration
Quarterly reports if <i>in absentia</i>	Adviser	
Written examination	Adviser and major and minor staff	At end of year's study or later, as arranged
Thesis subject	Adviser and group committee	Six months before graduation
Experience statement	Adviser and major staff ..	Six weeks before graduation
Filing thesis	Dean of Graduate School..	Six weeks before graduation
Fee for binding thesis ...	Registrar	One week before graduation

ATTENDANCE AT COMMENCEMENT

Unless specifically excused for an important reason, the candidate will be present in person to receive the degree.

DOCTOR'S DEGREE

In the Graduate School, one Doctor's degree, doctor of philosophy (Ph.D.), is conferred by the University of Minnesota. This degree is granted, not on the basis of successful completion of a definite amount of prescribed work but chiefly in recognition of the candidate's high attainments and ability in this special field, to be shown, first, by the preparation of a thesis, and second, by successfully passing the required examinations covering both the general and the special fields of the candidate's subjects as detailed later.

Candidates for the Doctor's degree must devote at least three years* of graduate study to approved subjects. The first two years or the last year must be spent in residence at the University of Minnesota.

A member of the staff of instruction above the rank of instructor will not be permitted to enroll for a Doctor's degree at this University. There is no objection, however, to his registering for graduate work at this University and credit so obtained may be presented elsewhere.

PROGRAM OF WORK

First year.—Upon entrance to the Graduate School, the student shall select his adviser with the approval of the dean. With the approval of his adviser he shall submit to the dean a program covering his first year's work.

Second and third years.—Before beginning the work of the second year, the student shall submit to his adviser and the group committee for approval a tentative outline of his work for the second and third years, including both the major and minor subjects. This program is then to be submitted to the dean for final approval. During the second quarter of the second year he shall file with his adviser's approval the subject of his Doctor's dissertation.

LANGUAGE REQUIREMENTS

Before admission to the preliminary examination, the student must present to the dean of the Graduate School statements from the French and German departments, certifying that the applicant has a reading knowledge of those languages.‡ In addition, a knowledge of other languages may

* This time requirement will be met in three years only by those students who devote all their time to graduate study. Students who merely devote the intervals of professional or other regular employment to graduate study will need to extend their total period of work over a longer period of time. Credit for such work will be given in proportion to the amount of time actually spent in the pursuit of graduate work.

‡ The substitution of other foreign languages of greater service in the major field may be permitted by the executive committee on recommendation of the group committee.

be required in certain cases, as the candidate's major department may prescribe. The student's adviser or his representative shall attend the language examinations and provide literature in the major field from which the test passages are selected. For the dates of these language examinations consult the calendar at the beginning of this bulletin.

THE MAJOR WORK

The major work must be in a department in which the candidate has had, in his undergraduate study, at least the equivalent of three years of work (18 semester or 27 quarter credits) if it be a department open to freshmen, or two years of work (12 semester or 18 quarter credits) if it be a department not open to freshmen. Part or all of this preliminary work may consist of designated prerequisite courses in the same or allied departments.

During the period of work for the Doctor's degree a student shall spend not less than two thirds of his time* on the major subject, including the work on the thesis. During the last two years, he shall carry an average of at least one course per quarter in his major in addition to the work from which this thesis is developed.

At the close of the second year's work, and before admission to the preliminary examination, the student must obtain the written recommendation of the major department members of the graduate faculty. Such written recommendation should state that in view of the work already done by the applicant, the department is convinced of his probable capacity and ability to meet all the requirements for the degree, including the thesis, the subject of which must be stated.

In the case of a student who comes from the last year of residence only, provision for the examination will be made by the dean and the major department.

THE MINOR WORK

The minor work must be selected in a department in which the student is prepared to pursue courses advanced enough in character to be included in the group designated "For Undergraduate and Graduate Students," and numbered 100 or above.

The choice of the minor must be in a department the work of which can be logically related to that of the department in which the student is doing his major work.

In exceptional cases, the dean and the group committee may allow the minor subject to be taken in the same department as that of the major or in two related departments.

Not less than one sixth of the total work of the three years shall be devoted to the minor subjects and all of this work shall be completed and certified to by the department in which the minor is taken before admission to the preliminary examination.

* In estimating the distribution of time, a week of 15 credit hours may be assumed.

THESIS

The thesis, for which the accumulation of material may well be started not later than the middle of the second year, must give evidence of originality and power of independent investigation, and embody results of research, which form a real contribution to knowledge as well as exhibit mastery of the literature of the subject and familiarity with the sources of knowledge. The matter must be presented with a fair degree of literary skill.

Not later than six weeks before the commencement at which he expects to take the degree, the student shall deposit at the dean's office his thesis, typewritten, in triplicate copy to facilitate reading by the thesis committee. After the final oral examination has been passed, the candidate should file in the office of the Graduate School one bound carbon copy of the thesis. The requirements concerning form, copyrighting, and printing adopted in June, 1922, may be consulted in the Graduate School office.

The dean will appoint a thesis committee, of which the student's adviser will usually be the chairman. The duty of this committee will be to read the thesis and vote upon its acceptance. Unanimous approval by this committee will be necessary to such acceptance.

Printing of the thesis.—If the thesis be accepted, the student shall deposit with the registrar, not later than one week before graduation, a sufficient bond or such sum of money as is needed to print one hundred copies of the thesis for the use of the University and as many additional copies as the candidate may require for himself. If the thesis is to be published elsewhere, reprints will be acceptable, if bound with covers in the special form required by the University.

EXAMINATIONS

Preliminary.—After the language examination (see p. 16) and at least seven months before the degree is conferred, a preliminary examination of the student shall be given by a committee appointed by the dean and including the student's adviser as chairman, a representative of the group committee other than his adviser, the chairman or head of the major department, a representative of the minor department, and such other members as the dean may consider advisable. Certificates of proficiency in French and German and completion of the minor and the recommendation of the major department shall be required before admission to this examination. The examination shall cover graduate work previously taken by the student, and may include any work fundamental thereto, except the thesis and the field of definite specialization. This examination shall be in addition to the usual course examinations. It may be written or oral, or both, at the discretion of the committee. Only after the successful completion of this examination may the student be enrolled as a candidate for the Doctor's degree. Students failing to pass this preliminary examination may be excluded from the candidacy for the degree and in any case shall not be re-examined until at least one quarter has passed.

Final written.—After the thesis is presented, and at least four weeks before examination, there shall be a written examination in the major subject, to be given by the members of the graduate faculty in the major department. This examination shall cover all the work done in the major, and *may include any work fundamental thereto.*

Final oral.—After successful completion of the written examination and acceptance of the thesis and not less than two weeks before graduation, the final oral examination shall be given. This examination shall be conducted by a committee consisting of the adviser as chairman, of the members of the thesis committee, and at least two other members of the graduate faculty appointed by the dean. At least one member of this committee shall be from a group other than the one in which the major department is included. This examination has special reference to the thesis and the field of the candidate's special studies and shall not exceed three hours.

The date of the final oral examination shall be publicly announced and the examination shall be open to any member of the graduate faculty. Upon completion of the examination, a formal vote of the committee shall be taken, and an affirmative vote of at least two thirds of the members shall be necessary for recommendation of the candidate for the degree.

Reports.—Special blanks are provided for signed reports concerning the thesis and the final oral examinations. All reports must be filed in the office of the dean of the Graduate School at least one week before graduation.

Candidates meeting the requirements as above outlined will be reported by the dean to the executive committee of the graduate faculty, who will by vote recommend to the Board of Regents those approved for degrees.

Candidates upon whom degrees are to be conferred are required to be present at commencement, unless especially excused by the dean of the Graduate School and the president of the University.

THE GRADUATE SCHOOL

TABULAR SUMMARY OF REQUIREMENTS FOR
THE DOCTOR'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
FIRST YEAR		
Major	Adviser and dean of the Graduate School	On registration
Minor		
SECOND YEAR		
Tentative program of entire second and third year's work	Adviser, group committee, and dean of Graduate School	Before beginning work of second year
Major, including thesis ...	As for tentative program..	} Before admission to preliminary examination
Minor	Adviser and minor department	
Language	Adviser and language department	
Recommendation	By major department	
Preliminary examination ..	Special committee	Seven months before degree is to be conferred
THIRD YEAR		
Major, including thesis ...	Advisers, group committee, and dean of Graduate School	Six weeks before taking the degree
Filing of thesis	Dean	
Examination of thesis	Thesis committee	Before admission to final oral examination
Final written examination..	Major department members of the graduate faculty..	Four weeks before taking degree and before final oral examination
Final oral examination ..	Special committee	Not later than two weeks before taking the degree
Bond for publication of thesis	Registrar	Not later than one week before taking the degree

DESCRIPTION OF COURSES

EXPLANATIONS

A *dagger* (†) indicates that all quarters of a course must be completed before credit is received for any quarter.

AERONAUTICAL ENGINEERING

Professor John D. Akerman; Assistant Professors Charles Boehnlein, Joseph A. Wise.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f-101w-102s. Aerodynamics. Atmospheric properties. Fluid mechanics. Stream functions and velocity potential. Motion of body in liquids in three dimensions. Prandtl's wing theory. Dynamic loads, stability, maneuverability, controllability. Prerequisites: Course 3 and M.&M. 26. Three credits. Mr. Boehnlein.
- 115f. Airplane Stresses. Deflections of structures. Theory of statically indeterminate structures. Analysis of fuselage trusses, landing gear, wing beams. Structural details and connections. Prerequisite: Course 83. Three credits. Mr. Wise.
- 116w. Advanced Airplane Stresses. Theory and design of monocoque fuselages. Multispar and unit construction wings. Vibrations. Wing and control-surface flutter. Analysis and design of seaplane hulls and floats. Prerequisite: Course 115. Three credits. Mr. Wise.
- 120f-121w-122s. Airplane Design. Stress analysis of wings, fuselages, chassis, control surfaces, etc. Specifications. Performance and design calculations. Propellers. Prerequisites: Courses 83, 102, M.&M. 128. 120f, two credits; 121w, four credits; 122s, three credits. Mr. Akerman.
- 123f,w,s-125f,w,s. Advanced Airplane Design. Problems in airplane design or development. Prerequisite: Course 121. Two to five credits per quarter. Mr. Akerman.
- 126f,w,s-127f,w,s-128f,w,s. Advanced Problems in Airscrew Design. Graphical and analytical methods of investigation. Prerequisite: Course 122. Two to five credits per quarter. Mr. Akerman.
- 140f. Aeronautical Laboratory. Study of airplane parts and their construction. Fittings. Rigging. Inspections and accessories. Prerequisite: Course 102. Two credits. Mr. Akerman.
- 141w. Aerodynamics Laboratory. Measurement of air flow. Calibration of Pitot tubes and anemometers. Distribution of air pressure on surfaces. Wind tunnel tests of wing, propeller, and airplane models. Prerequisite: Course 102. Two credits. Mr. Boehnlein.
- 160s. Airships. Theory and design. Rigid and non-rigid types. Stresses. Performance. Prerequisites: Courses 83, 102, M.&M. 128. Three credits. Mr. Akerman.

- 170s. Air Transport. Economics. Airports and airways and their equipment. Air commerce rules and regulations. Communication. Prerequisite: Aero.E. 102. Two credits.
- 190f-191w-192s. Seminar. Readings, reports, conferences, and discussions. Prerequisite: Course 102. One credit. Mr. Akerman.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 260s. Advanced Airship Stresses. Coplanar and space rigid frameworks. Secondary stresses. Buckling and elastic instability. Framework of dirigibles, gondolas, and cabins. Prerequisite: Course 115. Three credits. Mr. Wise.
- 272f-273w-274s. Research in Aeronautical Engineering. Two to five credits per quarter. Mr. Akerman, Mr. Boehlein, Mr. Wise.

AGRICULTURAL BIOCHEMISTRY

Professors Ross Aiken Gortner, Clyde H. Bailey, Leroy S. Palmer; Associate Professor Cornelia Kennedy; Assistant Professor William M. Sandstrom.

Prerequisites.—For major work, credit in general chemistry and qualitative analysis, in organic chemistry, in quantitative analysis, and at least ten quarter credits in biological science. The instructor with whom the student wishes to work may require additional prerequisites.

For minor work, credit in general chemistry and qualitative analysis, in organic chemistry, and 10 quarter credits in biological science. Minors should be arranged only after consultation with the instructors concerned.

All students majoring in this division and all minoring for the Doctor's degree must include either Course 201 or 202 in their study programs.

Candidates for the Master's degree must have a reading knowledge of German or French. (In special cases, where other languages are needed for the development of the thesis, Russian, Italian, or the Scandinavian languages may be substituted.)

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w. Agricultural Quantitative Analysis. Includes estimation of inorganic and organic constituents of biological products, proximate analysis of foods and feeding stuffs, and the use of special apparatus. Prerequisite: quantitative analysis. Three credits each quarter. MWF VI, VII, VIII; 208BCh. Mr. Bull.
- 103s. Dairy Chemistry. Lectures and laboratory work on the physical, colloidal, and chemical properties of milk and dairy products, and of the processes involved in the manufacture of dairy products. Lect. three credits, lect. and lab. five credits. Lect. MWF VI; lab. MWF VII, VIII, IX; 116 and 208BCh. Mr. Palmer.
- 108s. Chemistry of Wheat and Wheat Products. A lecture course, with collateral library reference work, on the chemical technology of the production and milling of wheat and its conversion into food. Pre-

- requisite: organic chemistry. Three credits. MWF I; 211BCh. Mr. Bailey.
- 110s. Flour Laboratory Methods. A laboratory course. Analysis of wheat and its products. Designed to train students for research in the cereal industry. Prerequisites: Course 101-102 or food analysis. Three, four, or five credits depending on the amount of work completed. MWF VI, VII, VIII, IX; 202BCh. Mr. Bailey.
- 111f,su-112w,su. Biochemistry. An advanced course dealing with the colloidal state, and the chemistry of proteins, carbohydrates, glucosides, tannins, fats, plant acids, enzymes and pigments, and their physico-chemical relations to vital processes. Prerequisites: organic chemistry, biology, 1 year. Three credits each quarter. Lect. MWF III; Rec. Th VI; 113BCh. Mr. Gortner, Mr. Sandstrom.
- 113f,su-114w,su-115s. Biochemical Laboratory Methods. A laboratory course paralleling the lectures in 111-112. Prerequisite: quantitative analysis, parallel 111-112. Two credits each quarter. T VI, VII, VIII, Th VII, VIII, IX; 202-208BCh. Mr. Sandstrom.
- 116w. Advanced Animal Nutrition. Recent developments in animal nutrition, covering the field of proteins, mineral metabolism, and vitamins. Prerequisite: Course 111 or physiologic chemistry. Three credits. TThS III; 116BCh. Mr. Palmer, Miss Kennedy.
- 117f,w,s. Laboratory Problems in Animal Nutrition. A laboratory course on methods used in nutrition studies. (Because of limited laboratory facilities permission must be obtained from the instructor before registration.) Prerequisite: Course 116.* Three credits. Ar. Miss Kennedy.
- 118f,w,s,su. Laboratory Problems in Biochemistry. Special laboratory work in the preparation and isolation of pure compounds, and in special methods of identification or determination of biochemical products. Prerequisites: Courses 111-112, 113-114; or 103 or 110. Three or five credits. Mr. Gortner, Mr. Bailey, Mr. Palmer, Mr. Sandstrom, Miss Kennedy.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f,w,s. Seminar in Plant Chemistry, Colloids, and Proteins. One credit. F IX; 310 BCh. Mr. Gortner, Mr. Bailey.
- 202f,w,s. Seminar in Nutrition and Dairy Chemistry. One credit. Ar. Mr. Palmer, Miss Kennedy.
- 203f,w,s,su. Research Problems. Special work on particular research problems other than the student's major thesis. Facilities are provided for biochemical investigations and for advanced studies in plant or animal nutrition. Two to five credits. Mr. Gortner, Mr. Bailey, Mr. Palmer, Miss Kennedy, Mr. Sandstrom.
- 205f,w,s,su. Special Topics in Biochemical Literature. Library work followed by the preparation of written reports upon either the historical

* Graduate students with acceptable prerequisites may be permitted on request to parallel Courses 116 and 117.

- development or the current literature of special biochemical problems. A reading knowledge of German is necessary and of French desirable. Prerequisite: Course 206, 207, or 208. Three credits. Mr. Gortner, Mr. Bailey.
- 206f. Colloids. Lectures dealing with the colloidal state, the preparation and properties of colloidal systems, and the relation of these to biochemical processes. Prerequisite: Course 111-112 or physical chemistry. Three credits. MWF II; 113BCh. Mr. Gortner.
- 207s. Enzymes. A lecture and library course on the nature of enzyme action, including methods of preparation and investigation of enzymes, their physical and chemical properties and their methods of action. Prerequisite: Course 111-112 or physiologic chemistry. Three credits. MWF III; 116BCh. Mr. Sandstrom.
- 208w. Proteins. Lectures on the composition, structure, physical chemistry, biochemical reactions, and functions of the proteins and amino acids. Prerequisite: Course 111-112. Three credits. MWF II; 113BCh. Mr. Gortner.
- 209w. Carbohydrates. A lecture and library course on the synthesis, structure, reactions, and functions of carbohydrates, with especial reference to those which play a rôle in biochemical or industrial processes. Prerequisite: Course 111-112 or advanced organic chemistry. Three credits. MWF II; 116BCh.
- 212f,w,s. Special Topics in Nutritional Chemistry. A special library course with written reports on assigned readings in protein, mineral, and vitamin nutrition, primarily to train the student as a critic in this field. Prerequisites: Course 116 and reading knowledge of German. Three credits. Mr. Palmer.

AGRICULTURAL ENGINEERING

Professor Harry B. Roe; Assistant Professors Arthur J. Schwantes, Hall B. White.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Advanced Drainage Problems. Special drainage problems including surface run-off, soil permeability, relation of soil and crop type to drainage, shape and regulation of water table in relation to root growth, etc. Prerequisite: Course 68. Three to six credits per quarter. Ar. Mr. Roe, Mr. Neal.
- 111f-112w-113s. Farm Building Problems. Investigations in building materials, methods of construction, cost and efficiency of farm buildings. Prerequisite: Course 67. Three to six credits per quarter. Ar. Mr. White.
- 121f-122w-123s. Farm Power and Machinery Problems. Special studies of farm machinery and mechanical power for the farm, including tests, design, and adaptability to various farm conditions. Prerequisite: Course 126. Three to six credits per quarter. Ar. Mr. Schwantes.

126s. Selection of Farm Equipment. Field laboratory study of types and construction of machinery and equipment suited to the various farm and farm home operations. Prerequisites: Courses 14 and 71. Three credits. MWF III; 106 En(UF), F III-IV; 49 En(UF). Mr. Schwantes.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. Reclamation Research. Studies of design and functioning of reclamation works with especial reference to soil types and soil water conditions. Prerequisites: Course 101 and one quarter's work in mathematical theory of statistics. Three to six credits per quarter. Ar. Mr. Roe.

211f-212w-213s. Farm Structures Research. Studies in farm structures as related to other factors in the farm business. Prerequisite: Course 111. Three to six credits per quarter. Ar. Mr. White.

221f-222w-223s. Farm Power and Machinery Research. Studies involving the design or utilization of power and machinery used in connection with farm operations. Prerequisite: Course 121. Three to six credits per quarter. Ar. Mr. Schwantes.

AGRONOMY AND PLANT GENETICS

Professor Herbert K. Hayes; Associate Professor Albert C. Army; Assistant Professor Harold K. Wilson.

Prerequisites.—In agronomy, sufficient work in plant science to satisfy the adviser that advanced work may be pursued profitably. Further courses may be required without credit if in the opinion of the adviser this is necessary. With the approval of the adviser, courses in agricultural biochemistry, botany, pathology, plant genetics, plant physiology, and soils may be accepted as part of the major work.

In plant genetics, for major or minor work, sufficient credits in plant sciences must be presented to satisfy the adviser. With the approval of the adviser, courses in agricultural biochemistry, agronomy, botany, horticulture, plant physiology, and plant pathology may be accepted as major work. Students majoring in plant genetics are required to continue study during at least one summer. Exemption is made if similar training has been obtained at some other institution.

COURSES IN AGRONOMY

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

121f. Grain Crops. Structure, function, culture, improvement, and uses of corn, wheat, oats, barley, rye, flax, and buckwheat. Prerequisites: Bot. 4, 5, 6. Three credits. TTh VI, VII, VIII; 100Ad(F). Mr. Wilson.

122w. Grain and Hay Grading. History and methods of grain grading. Problems involved and applications of work. Judging crops on basis of quality for seed. Prerequisite: Agron. 121, or equiv. Three credits. TTh VI, VII, VIII; 100Ad(F). Mr. Wilson.

- 123s. Forage Crops. A study of the structure, function, culture, improvement, and uses of forage crops including meadow and pasture management. Prerequisites: Bot. 4, 5, 6. Three credits. TTh VI, VII, VIII; 100Ad(F). Mr. Army.
- 124w,s. Problems in Farm Crops. Correlation of theory and practice of crop production and management by the problem method. Prerequisites: Agron. 1, 121, and 123 (parallel). Three credits. Ar.; 109Ag(F). Mr. Wilson.
- 125su. Advanced Farm Crops. The important phases of crop production in the light of modern scientific knowledge. Studies of the important agricultural crops with emphasis as follows: ecology in relation to crop distribution and adaptation, physiology of crop production and plant nutrition, anatomy of the plant as related to growth responses, environmental factors as diseases, insects, etc., tillage practices, maintenance of soil productivity, and methods of plant improvement through plant breeding. Prerequisites: qualified teachers in agriculture. Three credits. Ar. Mr. Wilson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f,w,s. Research in Farm Crops. Special problems in crop physiology, production, and classification of crop plants. Prerequisites: Agron. 121, 123. Three to nine credits. Ar. Mr. Army, Mr. Wilson.
- 202f,w,s. Farm Crops Seminar. Reviews and discussions of research articles and thesis problems. Prerequisite: Nine credits in farm crops. One and one-half credits per quarter. W VII, VIII; 109Ag(F). Mr. Army.
- 203s. Crop Research Results and Methods. Studies of the results of investigations with crop plants and applications to agronomic problems. Practice in formulating research plans and in carrying out laboratory technique. Prerequisites: Agron. 121, 123. Three credits. 109Ag(F). Mr. Army, Mr. Wilson.
- 204s. History and Classification of Crop Plants. Assignments, discussions, and laboratory work dealing with (a) the botany of crop plants and their evolution; (b) use of plant characters in the identification and systematic classification of species and varieties. Prerequisites: Bot. 113 or 114 or 115; Agron. 121 and 123. Three credits. 109Ag(F). Mr. Wilson.

COURSES IN PLANT GENETICS

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 131f,w. Principles of Genetics. Fundamental principles of breeding, heredity, variation, biometry, and evolution. Prerequisite: 9 credits in botany or zoology. Three credits. ThS I, T I, II; 102Ad(F). Mr. Powers.
- 132s. Farm Crops Plant Breeding. Applied genetics. Methods of breeding each of the important agricultural crops. Prerequisites: Course 131 or its equiv. Three credits. TTh VI, VII, VIII; 102Ad(F). Mr. Powers.

134f,w. Laboratory Problems in Genetics. Methods of taking and arranging genetics data. Special inheritance problems with *Drosophila*. Construction of chromosome map. May parallel Course 131. Ar; 303 Ag(F). Mr. Doxtator.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 241f,w,s. Research in Plant Genetics. Special problems in plant genetics, inheritance of plant characters, and cytological studies in relation to plant genetics. May be taken as major or minor work. Ar. Mr. Hayes, Mr. Powers.
- 242f,s. Plant Breeding Seminar. Plant genetics in relation to plant breeding, and a discussion of research problems. One credit per quarter. F VII, VIII; 109Ag(F). Mr. Hayes.
- 243f. Methods in Plant Breeding. The application of biometrical methods to field plot technique, the results of inbreeding and outbreeding, and the results of selection and crossing as a means of improving crop plants. Practice in outlining the correct mode of attack for special plant breeding problems. Three credits. Ar; 109Ag(F). Mr. Hayes.
- 244su,f. Laboratory Methods in Plant Breeding. Supplementing 243f. Practice in plant breeding technique, methods of controlling pollination, and handling of plant cultures. Three credits. Ar. Mr. Powers.
- 245w. Advanced Genetics. The establishment of a genetic factor hypothesis, linkage, gene mutations, chromosomal aberrations, and the goodness of fit of Mendelian ratios will be emphasized. Three credits. Ar; 109 Ag(F). Mr. Hayes.
- 246w. Genetics Seminar. Important contributions to genetic theory and practice. Two credits. F VII, VIII; 109Ag(F). Mr. Hayes.

ANATOMY

Prerequisites.—The Institute of Anatomy offers excellent facilities to students who wish to take advanced work or to pursue investigations in anatomy.

The prerequisite work for all students for major or minor in the Department of Anatomy includes general zoology (animal biology), 6 credits, and advanced zoology or elementary courses in anatomy (including histology, embryology, and neurology), 6 credits. In addition each student desiring a major in anatomy must have had the elementary courses in that branch of anatomy in which he desires to specialize—gross anatomy, histology, embryology, or neurology.

For staff and the description of courses, see the special bulletin on graduate work in medicine.

ANIMAL BIOLOGY

For offerings see Zoology.

ANIMAL GENETICS

Animal genetics may be elected as a field for major or minor study. For prerequisites and courses see those listed under Poultry Husbandry.

ANIMAL HUSBANDRY

Professors Walter H. Peters, Evan F. Ferrin; Associate Professor Laurence M. Winters; Assistant Professor Alfred L. Harvey.

Prerequisite.—For major work 18 quarter credits in Animal Husbandry or closely allied subjects.

Major and minor.—Upon approval of the graduate faculty, candidates doing their major work for the Master's degree in animal husbandry may take their minor in animal breeding or in meats. Candidates doing their major work for the Doctor's degree in animal husbandry must take a minor in some other department. With the approval of the adviser, courses in agricultural biochemistry, genetics, botany, economics, dairy husbandry, veterinary medicine, and zoology may be accepted, as major work.

Language requirement.—Students majoring in animal husbandry are exempted from the language requirement for the Master's degree.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Advanced Livestock Judging. Competitive judging of market and breed types of beef cattle, hogs, sheep, and draft horses, supplemented by visits to near-by stock farms. Three credits. MWF VI, VII; center arena, St(F). Mr. Harvey.
- 106w. Advanced Meats. Practice work in cutting carcasses and a study of carcass values of animals. Three credits. WF VI, VII, VIII; MS(F). Mr. Anderson.
- 107s. Meat Problems. The wholesale cuts and grades of meat, the packing industry and utilization of by-products, special problems and visits to meat packing establishments. Three credits. Lect. TS IV, lab. T VI, VII, VIII; MS(F). Mr. Anderson.
- 108f. Seminar. Special assignments and review of research problems pertaining to the livestock industry. One credit. T IX; 3St(F). Mr. Peters.
- 109w. Seminar. Continuation of 108. One credit. Mr. Peters.
- 110s. Seminar. Continuation of 109. One credit. Mr. Peters.
- 111w. Utilization of Meats. A study of the characteristics of different cuts of pork, beef, veal, mutton, and lamb with reference to palatability, nutritive value, chemical composition, economy, uses, and market value; a study is made of edible by-products, cured meats, and meat specialties. (For Home Economic students.) Three credits. ThS III, T III, IV; MS(F). Mr. Anderson.
- 112w. Animal Breeding. The application of the principles of genetics to the breeding of livestock; a review of the master-breeders' methods and consideration of the practical breeders' problems. Three credits. MWF IV; 3St(F). Mr. Winters.

- 113s. Livestock Management. Fitting the different types of livestock production into farm management systems. Management problems involved in beef cattle, sheep, swine, and horse production. Three credits. Lect. TS III; lab. Th VI, VII, VIII; 3St(F). Mr. Peters.
- 114s. Advanced Study of the Breeds of Livestock. A study of the history and blood lines in any of the leading breeds of livestock. Three credits. TThS II; 3St(F). Mr. Winters.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201s. Advanced Study of Animal Breeding. A review of recent scientific literature in the fields of the physiology of reproduction and animal genetics. Three to ten credits. Mr. Winters.
- 202f,w. Advanced Livestock Feeding. A study of experimental results bearing on feeding questions and review of scientific literature applicable to them. Three to ten credits. Mr. Ferrin.
- 203f. The Marketing of Livestock. A study of the methods used in the principal livestock markets; selling purebred livestock. Three credits. Mr. Peters.
- 205s. Experimental Methods. Theory, plan, and conduct of experimental work in animal husbandry. Factors affecting results, sources of error, interpretation of data. Three credits. Mr. Ferrin.
- 207s. Research in Meats. Special problems assigned to fit the needs of each student. Three to ten credits. Mr. Anderson.
- 208f,w,s. Research in Animal Husbandry. Special problems assigned to fit the needs of each student. Three to ten credits. Mr. Peters, Mr. Ferrin, Mr. Winters, Mr. Anderson.

ANTHROPOLOGY

Professors Albert Ernest Jenks, Wilson D. Wallis.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 106w. Types of Prehistoric Men and Cultures. Problems of chronology and distribution. MWF III; 12F. Mr. Jenks.
- 107s. American Archeology. Prehistoric man and cultures in America. MWF III; 9F. Mr. Jenks.
- 108s. Philippine Peoples. Not offered in 1931-32.
- 110f. Physical Anthropology. The physical types of man, prehistoric and contemporary. TThS III; 12F. Mr. Wallis.
- 112s. The American Negro. The physical types. Problems and methods of interracial adjustments. MWF II; 3F. (Alternates annually with 108.) Mr. Jenks.
- 113s. Peoples of Europe. Racial and cultural characteristics. MWF IV; 6F. Mr. Jenks.
- 114w. The American People. The physical, psychic, and cultural characteristics of the peoples in America. MWF VII; 25F. Mr. Jenks.

- 121w. Advanced Physical Anthropology. A critical study of problems in physical anthropology. Based on Course 110. Ar.; ar.; 12F. Mr. Wallis.
- 122f-123w-124s. Problems in Anthropology. Advanced work with individual guidance. Also honors course, anthropological backgrounds of the social sciences, on recommendation of their advisers. Hours and credits arranged. 12F. Mr. Jenks, Mr. Wallis.
- 150.† Field Trip in Archeology. Summer. One to 8 credits. Ar. Mr. Jenks.
- 161f. Primitive Religion. The religious concepts and practices of primitive peoples. MWF I; 12F. Mr. Wallis.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 204f-205w-206s. Seminar in Anthropology. Individually directed research. Hours and credits arranged. 12F. Mr. Jenks, Mr. Wallis.

ARCHITECTURE

Professors Frederick M. Mann, Leon E. Arnal, Robert T. Jones, Roy C. Jones; Associate Professor S. Chatwood Burton.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f,w,s-122f,w,s-123f,w,s. Freehand Drawing. Advanced life drawing, painting, or modeling and decoration. Prerequisite: Course 29. Two credits per quarter. Mr. Burton.
- 131f,w,s-132f,w,s-133f,w,s.* Architectural Design, Grade III. Long, short, and sketch problems under individual criticism dealing with complex compositions, and with subjects involving special character and a decorative and imaginative interest. Prerequisite: Course 39. Ten credits per quarter for 131 and 132; nine credits for 133. Mr. Arnal, Mr. R. C. Jones.
- 134f,w,s-135f,w,s-136f,w,s.* Interior Architectural Design. Problems done under individual criticism dealing with the decorative treatment, furniture, and accessories of interiors, for students in interior decoration. Prerequisite: Course 36. Seven credits per quarter. Mr. Arnal.
- 141f-142w-143s. Building Construction. An advanced study of the technology of building materials, soils, foundations, systems of framing, and fireproof and mill construction. Prerequisite: C.E. 41 or M.&M. 26. Two credits per quarter. Mr. R. T. Jones.
- 151f. Architectural Seminar. Literature of architecture; special topics, papers, and discussions. Prerequisite: senior standing. One credit. Mr. Mann.

† This course may be taken for credit only once.

* Work in all design courses is carried on simultaneously and students pass from one grade to the next in sequence in varying lengths of time according to their accomplishment and irrespective of university time units. Advancement is based upon design "points" earned.

- 153s. Business Relations. Relations of the architect, owner, and builder; professional ethics and practice; office administration. Prerequisite: Senior standing. Two credits. Mr. Mann.
- 163s. History of Sculpture and Painting. Historical study of ancient, Renaissance, and modern sculpture, and of the Renaissance and modern schools of painting. Prerequisite: Arch. 16. Two credits. Mr. Burton.
- 182f-183w-184s. Furniture and Decoration. Historical and technical study, for students in interior architecture, ornament, decoration, furniture, textiles, etc. Discussion of the use of color in decoration. Prerequisites: Courses 16, 26. Three credits per quarter.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 219f,w,s. Special Researches in Architectural History. Prerequisite: completion of undergraduate architectural history. Five credits or less per quarter. Ar; 320ME. Mr. Mann.
- 220f,w,s. Archeology. Prerequisite: completion of undergraduate architectural history. Three credits or less per quarter. Hrs. ar. Mr. Arnal.
- 221f,w,s-222f,w,s-223f,w,s. Life Drawing and Figure Composition. Prerequisite: completion of undergraduate freehand drawing. Two credits per quarter. Hrs. ar. Mr. Burton.
- 239f,w,s. Advanced Architectural Design. Prerequisite: completion of undergraduate design. Ten credits or less per quarter. MTWThF VI, VII, VIII, IX, S I, II, III, IV; 317ME. Mr. Arnal.
- 240f,w,s. Technology of Building Materials. Prerequisite: Arch. 143. Three credits per quarter. Hrs. ar. Mr. R. T. Jones.
- 243f,w,s. Advanced Interior Decoration Design. Prerequisite: Arch. 136. Ten credits or less per quarter. Ar. Mr. Arnal.
- 287f,w,s-288f,w,s-289f,w,s. Advanced Modeling. Continuation of Arch. 89. Prerequisite: Course 89. Two credits per quarter. Mr. Burton.

ASTRONOMY

Assistant Professor Willem J. Luyten.

The Astronomical Observatory contains a ten and one-half inch refracting telescope furnished with a third lens for converting it into a photographic telescope; a five-inch star camera; a filar micrometer; a spectroscope by Brashear; a meridian circle and zenith telescope; a Repsold photographic measuring machine; a chronograph, and astronomical clocks.

Prerequisites.—For major work, Course 51-52-53 and Mathematics 50; for minor work, Mathematics 50 and 3 credits in astronomy.

Exemptions from the language requirement for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f-122w-123s. Astrophysics. An introductory course, with particular reference to stellar spectroscopy. Practice in measurement of spectrographic plates. Three credits. Ar. Mr. Luyten.

- 140w. Method of Least Squares. Applied especially to engineering, physics, and astronomy. Prerequisite: Mathematics 51. Three credits. Ar. Mr. Luyten.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 211f-212w-213s. Seminar. For students who are prepared for advanced work along particular lines. One, two, or three credits. Ar. Mr. Luyten.

BOTANY

Professors C. Otto Rosendahl, William S. Cooper, Josephine E. Tilden; Associate Professors George O. Burr, Frederic K. Butters; Assistant Professor Alan E. Treloar.

NOTE.—For courses in plant pathology and mycology, see Department of Plant Pathology.

Prerequisites.—For major work, 36 quarter credits in botany; for minor work, 20 credits.

Language requirements.—Candidates for the Master's degree must have a reading knowledge of German or French; for the Doctor's degree, both are required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Biometric Principles. An introduction to the mathematical analysis of biological data, dealing with uni-variate distribution, probability, correlation and linear regression. Three credits. Lect. TThS III; lab. ar.; 202Bo. Mr. Treloar.
- 101s. Biometric Principles. (See 101f.) Lect. TThS I; lab. ar.; 202Bo. Mr. Treloar.
- 108w. Morphology and Taxonomy of the Pteridophytes. An intensive study of lycopods, ferns, and their allies, their structure and history, with special attention to the classification of living forms. Lectures, reference reading, and laboratory work. Prerequisites: Courses 7 and 23. Five credits. Ar.; 304Bo. Mr. Butters.
- 110w. Morphology and Taxonomy of the Gymnosperms. An intensive study of cycads, conifers, and their allies, their structure and history, with special attention to the classification of living forms. Lectures, reference reading, and laboratory work. Prerequisites: Courses 7 and 63. Five credits. Mr. Butters.
- 113f-114w-115s. Advanced Taxonomy of the Flowering Plants. An advanced course in which special attention is given to the taxonomy of difficult natural groups, involving systematic principles and practice, rules of nomenclature, systems of classification, etc. Prerequisite: 15 credits, including Course 7. Nine credits. MWF VI, VII, VIII; 303Bo. Mr. Rosendahl.
- 118w. Cytology. A survey of cell structure and the various phenomena of division, fusion, and metamorphosis, together with a review of the

- history of cytological investigations. Methods of cytological research indicated in the laboratory. Prerequisite: 18 credits. Five credits. MTWThF I, II; 303Bo. Mr. Rosendahl.
- 124s, 125su, 126f.* Morphology and Taxonomy of Algae: Algal types. Advanced studies in selected groups. Prerequisite: 15 credits including Course 12, or consent of instructor. Three to five credits. TThS III, IV; 110Bo. Miss Tilden.
- 127s. Anatomy of Vascular Plants. The microscopic structure of vascular plants with particular attention to the development and evolution of the vascular system in the root, stem, and leaf. Prerequisite: 18 credits. Five credits. Lect. MWF I; lab. ar.; 304Bo. Mr. Butters.
- 131f. Field Ecology. A survey of the local plant communities and successions, and a study of the general principles of plant association and succession. Prerequisite: Course 21. Five credits. MWF VI, VII, VIII; 214Bo. Mr. Cooper.
- 132w. Ecological Anatomy. The individual plant and its parts as related to environment; special plant forms and structures, their causes and significance. Prerequisite: Course 21. Five credits. MWF VI, VII, VIII; 214Bo. Mr. Cooper.
- 133s. Plant Geography of North America. Preliminary discussion of the principles of plant distribution followed by a detailed study of the vegetation regions of North America. Prerequisite: Course 21. Five credits. MWF VI, VII, VIII; 214Bo. Mr. Cooper.
- 134s. Research Methods in Ecology. Theory and practice of instrumental study of the habitat and of precise investigation of community and succession. Prerequisite: Course 21. Five credits. MWF VI, VII, VIII; 214Bo. Mr. Cooper.
- 140w. General Plant Physiology. Advanced survey of the whole field of plant physiology. Prerequisites: Course 22 and elementary inorganic chemistry. Five credits. MTWThF VI, VII; 102Bo. Mr. Burr.
- 141f. Physico-chemical Principles in Plant Physiology. Properties of solution, buffers, osmosis, transpiration, electrometric measurements. Prerequisites: Course 22 and general organic chemistry. Five credits. Lect. MWF 7:55 am.; lab. MF II, III, IV; 104Bo. Mr. Burr.
- 142w. Photosynthesis. A detailed discussion of conditions, theories, and energy relations in the assimilation of carbon. Prerequisites: Course 22 and general organic chemistry. Five credits. Lect. MWF 7:55 a.m.; lab. MF II, III, IV; 104Bo. Mr. Burr.
- 143s. Plant Metabolism. Nitrogen assimilation and protein synthesis, metabolism of carbohydrates, fats and proteins, biological oxidation, respiration. Prerequisites: Course 22 and general organic chemistry. Five credits. Lect. MWF 7:55 a.m.; lab. MF II, III, IV; 104Bo. Mr. Burr.
- 145w. Advanced Biometry (1). Theory and practical exercises in biometric analysis involving the correlation ratio, contingency methods,

* Any of the above courses may be taken separately.

- partial correlation and multiple prediction. Prerequisite: Course 101. Three credits. Lect. TThS III; lab. ar.; 202Bo. Mr. Treloar.
- 146s. Advanced Biometry (2). Theory and practical exercises in biometric analysis, involving a discussion of frequency curves, the normal surface, bi-serial, tetrachoric and equivalent probability correlation methods. Prerequisite: Course 145. Three credits. Lect. TThS III; lab. ar.; 202Bo. Mr. Treloar.
- 149s-150su-151f.* Advanced Phycology. A general survey based on studies in the field and laboratory. Designed for teachers and research workers who wish to acquire a practical knowledge of the algae. Problems assigned and reports required. Prerequisite: 15 credits including Courses 124, 125, or 126, or consent of instructor. Three to ten credits. TTh VI, VII, VIII; 110Bo. Miss Tilden.
- 153f. Biometric Methods. A discussion of particular methods in biometric analysis with special reference to the trustworthiness of constants and the significance of differences. Prerequisite: Course 101. Three credits. Lect. TThS I; lab. ar.; 202Bo. Mr. Treloar.
- 153w. Biometric Methods. See 153f. Lect. MWF I; lab. ar.; 202Bo. Mr. Treloar.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-202-203. Research Problems in the Morphology of Vascular Plants. Mr. Butters.
- 205-206-207. Research Problems in the Taxonomy of Angiosperms. Mr. Rosendahl.
- 209s-210su-211f. Research Problems in Algae. Miss Tilden.
- 213-214-215. Research Problems in Embryology. Mr. Butters.
- 217s-218su-219f. Special Research Problems in the Taxonomy and Distribution of Algae. Directed work in special areas approved by the instructor. Miss Tilden.
- 221-222-223. Research Problems in Ecology. Mr. Cooper.
- 225-226-227. Research Problems in Plant Physiology. Mr. Burr.
- 229-230-231. Research Problems in Cytology. Mr. Rosendahl.
- 233-234-235. Seminar. Students may register for one-hour seminar credit per quarter in any of the research subjects.
- 237f-238w-239s. Research Problems in Biometry. Mr. Treloar.
- 241s-242su-243f. Review of Phycological Literature with Reference to Selected Problems. Miss Tilden.

CHEMICAL ENGINEERING

Professor Charles A. Mann; Associate Professors George H. Montillon, Ralph E. Montonna.

Prerequisites.—Before being admitted to major work in chemical engineering, the student should have received the Bachelor's degree in chemical engineering or its equivalent. If he has not met this requirement, it will be necessary for him to pursue such additional preparatory studies as may be prescribed by the adviser.

* Any of the above courses may be taken separately.

The student selecting chemical engineering as a minor must present as prerequisites mathematics including integral calculus, physics, analytical and organic chemistry, and mechanical drawing.

Requirements.—For the Master's degree in chemical engineering, the major subject and the thesis must be taken in chemical engineering.

Students may not select chemical engineering in combination with any branch of chemistry as major and minor subjects except with the approval of the group committee.

The candidate for the Master's or the Doctor's degree with chemical engineering as a major must have completed, as undergraduate or graduate, a year's work in physical chemistry, such as, for example, Phys. Chem. 101f-102w-103s or their equivalent.

For the requirements for the professional degree of chemical engineer, see pages 13, 14, and 15.

Languages.—Candidates for the Master's degree in chemical engineering must have a reading knowledge of German or French; German is preferable in this field. For the Doctor's degree, both are required.

Examinations.—The written and oral preliminary examinations in chemistry for the Doctor's degree will be given at only four periods during each year. Normally, these will be during the first two weeks of each regular quarter and of the first term of the summer quarter. The exact schedule will be announced at the beginning of each quarter.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f,su. Unit Processes. Principles and methods of operation, construction, and uses of machinery for the unit processes. Lectures and recitations. Visits to chemical plants. Prerequisites: Anal. Chem. 1, 2. Three credits. MTWFS I; 225C. Mr. Mann.
- 102s,su. Unit Process Problems. Problems in combustion, furnaces, and kilns, the study of crystallization on a commercial scale. Prerequisite: Course 101. Three credits. MWF II; 111C or ar. Mr. Montillon, Mr. Ruth.
- 103f. Unit Process Problems. Problems in heat transfer, the use and design of heat exchangers, the applications of the laws of fluid flow, filtration, filter presses and centrifugals. Prerequisite: Course 101. Three credits. MWF II; 111C or ar. Mr. Montillon, Mr. Ruth.
- 104w. Unit Process Problems. Problems in leaching and dissolving, counter-current extraction, gas absorption, and distillation. Drying by air, steam, and direct heat dryers, single and multiple effect evaporators. Prerequisite: Course 101. Three credits. MWF II; 111C or ar. Mr. Montillon, Mr. Ruth.
- 111f-112w-113s. Design of Chemical Equipment and Plants. Design of equipment and layout of plants based on collected data. Classroom and laboratory work. Prerequisites: Courses 102-103-104, 117, 131, 132. Two credits per quarter. Ar. Mr. Montillon.
- 117s. Chemical Engineering Equipment Design. Fundamental principles in the design of simple chemical engineering equipment. Laboratory work.

- Prerequisite: Course 104. Three credits. Lect. T IV; lab. TTh VI-IX; 410C. Mr. Montonna.
- 121w. Chemical Engineering Economics. The economic and business considerations controlling chemical engineering industries. Statistical analysis of the characteristics of those industries. Raw and finished products. Principles of plant location, layout, and design. Unit operation cost, principles of management, operation, and control. Lectures and recitations. Prerequisite: Course 132. Three credits. MWF III; 111C. Mr. Montonna.
- 131w. Industrial Inorganic Chemistry. Operations common to chemical industries, chemistry involved, apparatus used, marketing of products, utilization of by-products, use of trade journals. Topics: acids and alkalis, salts, chlorine, ammonia, glass, pigments, etc. Lectures and recitations. Prerequisite: Course 101. Four credits. MTWFS I; 325C. Mr. Mann.
- 132s. Industrial Organic Chemistry. Similar to 131 but covering organic field. Destructive distillation of coal and wood, petroleum oils, paper unit organic processes, vegetable and animal oils, fats, waxes, soap, sugar, starch, etc. Lectures and recitations. Prerequisite: Course 101. Four credits. MTWThF I; 325C. Mr. Mann.
- 133f. Chemistry of Explosives. The history and development of modern explosives, their manufacture and uses. Lectures, required reading, and reports. Prerequisite: Course 132. Three credits. MWF I; 111C. Mr. Montonna.
- 134f. Intermediates and Dyestuffs. Their technical chemistry and manufacture. Processes, purification, uses, etc. Lectures and recitations. Prerequisite: Course 132 or equiv. Three credits. (May be accompanied by laboratory work in 160.) TThS I; 111C. Mr. Montonna.
- 136w. Chemistry and Technology of Cellulose. Discussions on processes and industries based on the use of cellulosic materials including the chemical and technological considerations. Pulp and paper, plastics, esters, artificial silks, etc. Lectures and recitations. Prerequisite: Org. Chem. 52 or equiv. Three credits. TThS I; 111C. Mr. Montonna.
- 141s. Gas Manufacture and Distribution. Fundamental principles of manufacture of coal gas, carbureted water gas, and other industrial fuel gases, and the apparatus for manufacture and distribution. Open to chemists and chemical engineers. Prerequisite: Org. Chem. 52. Three credits. Ar. Mr. Montillon.
- 150s. Unit Process Laboratory. Operation and testing of chemical engineering equipment. Laboratory work and reports. Prerequisite: Course 101. One credit. Lab. Sec. 1, M VI-VIII, Sec. 2, W VI-VIII, Sec. 3, S I-III, Sec. 4, ar.; 90C. Mr. Ruth.
- 151f,su. Chemical Manufacture (Inorganic). Manufacture of technical products on a scale large enough to afford data for the determination of costs of manufacture. Use of semiplant scale equipment. Technical trade journals used. Laboratory. Prerequisite: Course 101. Three or more credits. Ar. Mr. Montonna.

- 152w,su. Chemical Manufacture (Organic). Similar to 151 but covering the organic field. Laboratory. Prerequisite: Course 101. Three or more credits. Ar. Mr. Montonna.
- 153f-154w-155s-156su. Special Laboratory Problems. Laboratory investigations on equipment and the manufacture of special chemical products on a large scale. Prerequisites: Courses 151, 152. Three or more credits. Ar. Mr. Montonna.
- 160s. Intermediates and Dyestuffs Laboratory. The manufacture of intermediates and dyestuffs on a large scale using semi-works equipment. Operations on sulphonation, hydroxylation, nitration, reduction, alkylation, diazotization, coupling, etc. Laboratory. Prerequisite: arranged. Three or more credits. Ar. Mr. Montonna.
- 176f-177w. Applied Electrochemistry. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and electrochemical products. Class and laboratory work. Prerequisite: Phys. Chem. 103. Four credits per quarter. Lect. MWF I; 115C. Lab. W or Th VI-VIII; 25C. Mr. Montillon.
- 179s. Advanced Applied Electrochemistry. The more recent development in the manufacture of inorganic and organic products. Lectures and recitations. Laboratory optional. Prerequisites: Courses 176, 177. Three credits. MWF III. Mr. Mann.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Seminar. Presentation and discussion of papers concerning the newer developments in chemical industries. One credit per quarter. Ar. Mr. Mann.
- 301f-302w-303s. Research in Chemical Engineering. Unit processes, applied electrochemistry and electric furnace work, and chemical manufacture. Credits arranged. Mr. Mann, Mr. Montillon, Mr. Montonna.

CHEMISTRY

Professor and Director, Samuel C. Lind.

The work in the School of Chemistry is organized in six divisions or branches, namely, Inorganic, Analytical, Organic, Physical, Technological Chemistry, and Chemical Engineering. Course numbers must be preceded by the name of the division in which they occur, as Org. Chem. 151f.

In addition to the completion of the prescribed work, the candidate for a higher degree is expected to show a maturity acquired by intensive personal study of the literature and of the methods of chemistry.

Prerequisites.—(a) A branch of chemistry as a *major* subject: All candidates who choose chemistry as a major subject for an advanced degree must offer the following courses or their equivalent as prerequisites: at least 12 quarter credits in general inorganic chemistry and qualitative analysis, at least 10 credits in quantitative analysis, and at least one year of organic chemistry. All candidates must present at least one year of college physics and one year of college mathematics. (b) Chemistry or a branch

of chemistry as a *minor* subject: Students may not select two branches of chemistry as major and minor subject except with the approval of the graduate faculty in the School of Chemistry.

Students whose major work lies in another field and who desire to minor in chemistry, must present as preparation prerequisite at least 12 credits of general inorganic chemistry and qualitative analysis, and 5 credits of quantitative analysis or 5 credits of organic chemistry.

The choice of the particular courses to be presented in fulfillment of a minor in graduate work will be made after consultation with the student's adviser. Organic Chemistry, Courses 151-152-153 will be acceptable as a minor for the Master's degree, or for not more than 9 credits of a minor for the Doctor's degree, if the student is not taking major work in chemistry.

Language requirements.—Candidates for the Master's degree must have a reading knowledge of German or French; German is preferred. For the Doctor's degree, both are required.

Examinations.—The written and oral preliminary examinations in chemistry for the Doctor's degree will be given at only four periods during each year. Normally, these will be during the first two weeks of each regular quarter and of the first term of the summer quarter. The exact schedule will be announced at the beginning of each quarter.

CHEMISTRY, ANALYTICAL

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

Professor Izaak M. Kolthoff; Associate Professor Isaac W. Geiger;
Assistant Professor Landon A. Sarver.

123f-124w-125s. Advanced Analytical Chemistry. A systematic survey by general lectures with typical procedures selected for laboratory practice. Drill in application of modern chemical theory to analytical problems. One lecture, seven laboratory hours per week. Prerequisites: Courses 101 and 102 or 7. Three credits. Lect. T VI; 315C. Lab. T VII-IX, Th VI-IX; 310C. Mr. Sarver.

127f-128w-129s. Analytical Chemistry of the Rare Elements. A survey of the quantitative methods for the estimation of the rare elements other than the rare earths. Analyses of commercially important alloys, ores, and compounds. One lecture and seven laboratory hours per week. Prerequisite: Anal. Chem. 101, 102. Three credits per quarter. Mr. Geiger.

131f. Applications of Indicators to Neutralization Reactions and to P_h Determinations. Prerequisites: Anal. Chem. 1 and 2 and Phys. Chem. 103. Three credits. Mr. Kolthoff.

132w-133s. Electrometric Measurements and Titrations. The application of potentiometric and conductometric methods to analytical work. Prerequisites: Anal. Chem. 1 and 2 and Phys. Chem. 103. Three credits. Mr. Kolthoff.

134f,w,s. Seminar: Modern Problems in Analytical Chemistry. Prerequisites: Anal. Chem. 1 and 2 and Phys. Chem. 103. One credit. Mr. Kolthoff.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Selected Topics in Analytical Chemistry. Credits arranged. Lect. and lab. Mr. Kolthoff.
- 301f-302w-303s. Research in Quantitative Analysis. Credits arranged. Mr. Kolthoff, Mr. Geiger, Mr. Sarver.

CHEMISTRY, INORGANIC

Professors M. Cannon Sneed, Lloyd H. Reyerson; Associate Professors Lillian Cohen, George Glockler; Assistant Professors Hervey H. Barber, Henry N. Stephens.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101s. History of Chemistry. The theories of chemistry from the period of the ancients, with particular emphasis on modern theories and laws. Prerequisite: Org. Chem. 52. Two credits. Miss Cohen.
- 102w. Advanced Qualitative Analysis. Includes an analysis of minerals, alloys, paints, and the methods of detecting some of the rarer elements. Prerequisites: Anal. Chem. 1 and 2. Two or three credits. Mr. Sneed.
- 103f-104w-105s. Advanced Inorganic Chemistry. A discussion of the periodic system and the chemistry of the elements and their compounds and of special subjects of inorganic chemistry such as valency, oxidation and reduction, complex ions, etc. Prerequisites: Anal. Chem. 1 and 2, Org. Chem. 52. Three credits per quarter. Lect. MWF IV; 111C. Mr. Sneed.
- 106f-107w-108s. Chemistry of the Rare Elements. History, occurrence, preparation, and properties of the less usual elements. Classification, valence, and atomic structure of these elements as related to the natural system of the chemical elements. Preparation and properties of their compounds. Use of the microscope and the spectroscope in following the course of the purification. Prerequisite: Anal. Chem. 1 or 2 or by permission. Three credits. Mr. Glockler.
- 134f-135w-136s. Seminar. Modern problems in inorganic chemistry. Prerequisites: Anal. Chem. 1 and 2 and Phys. Chem. 103. One credit. Mr. Sneed.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 301f-302w-303s. Research Work in Inorganic Chemistry. Credits arranged. Mr. Sneed, Mr. Reyerson.

CHEMISTRY, ORGANIC

Associate Professor Lee I. Smith; Assistant Professors Walter M. Lauer, Henry N. Stephens.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Advanced Organic Chemistry. An introduction to the literature of organic chemistry. Structure, reaction mechanism, and relation of physical properties to constitution. May be accompanied by appropriate laboratory work in Course 139. Prerequisite: Course 53. Three credits per quarter. TThS III; 315C. Mr. Sprung.

- 111f. Reagents in Organic Chemistry. A discussion of typical reagents used in organic reactions: their limits of applicability, methods of use, and types of substances with which they react. May be accompanied by appropriate laboratory work in Course 137. Prerequisite: Course 53. Four credits. MWF II; 325C. Mr. Smith.
- 113s. The Aliphatic Compounds. An advanced descriptive course, with special emphasis upon the compounds having more than one functional group. May be accompanied by appropriate laboratory work in Organic Chemistry 139. Prerequisite: Course 53. Three credits. MWF II; 315C. Mr. Smith.
- 115w. The Heterocyclic Compounds. A discussion of the nomenclature, preparation, properties, and uses of the typical heterocyclic systems. May be accompanied by appropriate laboratory work in Course 139. Prerequisite: Course 53. Three credits. Mr. Smith. (Not offered in 1931-32.)
- 116f. The Terpenes. The terpenes and their oxygen derivatives. The constituents of essential oils. The constitution of the rubber hydrocarbon with the important theories of oxidation and of vulcanization. Prerequisite: Course 53. Mr. Stephens.
- 122s. The Aromatic Compounds. The chemistry of the aromatic compounds with special reference to dye intermediates and synthetic drugs. Prerequisite: Course 53. Three credits. Mr. Lauer. (Not offered in 1931-32.)
- 123w. Dyes. A study of the important classes of dyes from the viewpoint of the organic chemist. Prerequisite: Course 53. Three credits. Mr. Lauer. (Not offered in 1931-32.)
- 137f,w,s. Advanced Organic Chemistry Laboratory. Difficult preparations and problems. It is intended primarily to supplement the student's knowledge of the methods of organic chemistry. Prerequisite: Course 53. Two to five credits. Laboratory arranged. 390C. Mr. Lauer.
- 139f,w,s. Advanced Organic Chemistry Laboratory. Selected laboratory problems of an advanced nature, including some original work. An introduction to research work. These advanced laboratory courses may be taken under any member of the Division of Organic Chemistry. Students may also register for this course who desire appropriate laboratory work for other advanced courses. Prerequisite: Course 53. Two to five credits. Mr. Sprung.
- 151f-152w-153s. Organic Chemistry. An introduction to the chemistry of carbon compounds. The laboratory work will include the preparation of characteristic substances. Not offered to students taking major work in chemistry. See introductory statement. Prerequisite: Fifteen credits in chemistry. Three credits per quarter. Lect. MWF III; 315C. Rec. S III. Lab. TTh VI-VII; 390C. Mr. Sprung.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Organic Chemistry Seminar. One hour per week. One credit. Open only to students taking research in organic chemistry. Mr. Sprung.

301f-302w-303s. Research in Organic Chemistry. Credits arranged. Mr. Smith, Mr. Lauer, Mr. Stephens.

CHEMISTRY, PHYSICAL

Professors Samuel C. Lind, Frank H. MacDougall, Lloyd H. Reyerson; Associate Professor George Glockler; Assistant Professors Robert S. Livingston, Nelson W. Taylor.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Physical Chemistry. A general survey of the subject. Three lectures and one recitation. Laboratory work three or six hours per week. Prerequisites: Two years college chemistry, one year college physics. Three, four, or five credits, depending on the amount of laboratory work. Lect. MWF IV; 325C. Rec. S IV; 115C. Lab. WF VI-VIII; 15C, 117C. Mr. MacDougall.
- 116f-117w-118s. Advanced Physical Chemistry. Three lectures and one recitation. Laboratory work for one three-hour period may be taken if desired. Prerequisites: Course 103 and calculus. Three credits per quarter, or four with laboratory. Mr. Taylor.
- 129s. Principles of Colloidal Chemistry. Prerequisites: Course 103 and calculus. Two credits. Mr. Reyerson.
- 130s. Applications of Colloidal Chemistry. Prerequisite: Course 103. Two credits. Mr. Reyerson.
- 131f-132w-133s. Colloid Chemistry Laboratory. Credits and hours arranged. Must be preceded or accompanied by Course 129 or 130. Mr. Reyerson.

PHOTO AND RADIO CHEMISTRY

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 161f-162w. Radioactivity. Discovery; theory of atomic disintegration; properties, transformations, and preparation of radioactive elements; properties and effects of alpha, beta, and gamma rays; radioactive and non-radioactive isotopes. Prerequisite: Phys. Chem. 103. Two credits per quarter. Mr. Lind.
- 164f,w,s. Radioactivity Laboratory. Use and standardization of electroscopes, radioactive measurements, and quantitative determination of radium in ores, minerals, waters, and plant products. One or two credits. Must be preceded or accompanied by Radioactivity 161. Mr. Lind.
- 175s. Photochemistry. History, development, and present status of photochemistry. Prerequisite: Optics and Phys. Chem. 103. Three credits. Mr. Lind.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Thermodynamics and Chemistry. A detailed study of the principles of thermodynamics and their application to physical and chemical phenomena. Prerequisites: Course 103 and calculus. Four credits per quarter. Mr. MacDougall.

- 204f-205w-206s. Kinetic Theory and Atomistics. Kinetic theory of gases and liquids, crystal structure, structure of atom, quantum theory. Prerequisites: Course 103 and calculus. Four credits per quarter. Mr. MacDougall.
- 211f-212w-213s. Advanced Physical Chemistry Laboratory. To accompany or follow any of the advanced courses in physical chemistry. Prerequisite: Course 103. Credits arranged. Mr. MacDougall.
- 251f-252w-253s. Physical Chemistry Seminar. One hour a week. For students taking advanced courses in physical chemistry. One credit. Mr. MacDougall, Mr. Reyerson, Mr. Taylor.
- 271f-272w-273s. Chemical Activation. (Seminar 1 hour per week for graduate students.) The current theories of chemical activation, including photochemical excitation, gaseous ionization, and the kinetics of cluster and of chain reactions. Prerequisites: Physics and physical chemistry. One credit per quarter. Mr. Lind.
- 301f-302w-303s. Research in Physical Chemistry. Including work in electrochemistry, photo and radio chemistry, and colloids. Credits arranged. Mr. Lind, Mr. MacDougall, Mr. Reyerson, Mr. Glockler, Mr. Livingston, Mr. Taylor.

CHEMISTRY, TECHNOLOGICAL

Associate Professor Everhart P. Harding; Assistant Professor Arthur E. Stoppel.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f-101w-102s. Food Analysis. Prerequisites: Anal. Chem. 1 and 2. Three credits per quarter. Lect. T IV; 215C. Lab. TF VI-VIII; 217C. Mr. Stoppel.
- 103w. Exact Gas Analysis. Prerequisites: Anal. Chem. 1 and 2. One or two credits. Mr. Harding.
- 104s. Microchemistry. The precipitation, examination, and identification of minute quantities of substances and the examination of food materials, fibers, etc., by means of the microscope. Prerequisites: Anal. Chem. 1 and 2. One or two credits. Mr. Harding.
- 105f. Gas and Fuel Analysis. The chemical analysis and calorimetry of solid and gaseous fuels and methods of testing municipal gas. Prerequisites: Anal. Chem. 1 and 2. Three credits. Lect. S II; 225C. Rec. Sec. 1, S IV, Sec. 2, W VI; 215C. Lab. Sec. 1, T II-IV, Th I-III, Sec. 2, W VII-IX, F VI-VIII; 10C. Mr. Harding.
- 106w. Petroleum and Petroleum Products. Examination and testing principally of gasoline, illuminating, and lubricating oils. Prerequisites: Anal. Chem. 1 and 2. Three credits. Lect. S II; 225C. Rec. Sec. 1, S IV, Sec. 2, W II; 215C. Lab. Sec. 1, T II-IV, Th I-III, Sec. 2, MW VI-VIII; 10C. Mr. Harding.
- 107f,w,s. General Technical Analysis. Includes any one or several of such topics as: textiles and paper, paints and varnishes, asphalt and tars, boiler waters, soaps, edible oils and fats, and various other food mate-

- rials and food products. Prerequisites: Anal. Chem. 1 and 2. One, two, or three credits. Mr. Harding.
- 130f. Chemistry of Foods. Course in the origin, composition, and manufacture of foods. Systems of food inspection, legal food standards, and adulteration. Lectures and recitations. Three credits. Mr. Stoppel.
- 140w. Sanitary Chemistry. Discussion of the chemistry of potable waters and sewage. Purification of water supplies, and the treatment of municipal and industrial wastes. May be accompanied by appropriate laboratory work in Tech. Chem. 107-108-109. Lectures and recitations. Prerequisite: Bact. 41 or by permission. Three credits. Mr. Stoppel.
- 160s. Paints, Oils, Varnishes, Lacquers, and Enamels. Their technical chemistry, properties, and composition. May be accompanied by appropriate laboratory work in Tech. Chem. 107-108-109. Lectures and recitations. Three credits. Mr. Stoppel.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 301f-302w-303s. Research in Technological Chemistry. Credits arranged. Mr. Harding, Mr. Stoppel.

CHILD WELFARE

Professors John E. Anderson, Florence L. Goodenough; Associate Professors Josephine C. Foster, Esther McGinnis; Assistant Professors Edith Boyd, Mary M. Shirley.

Prerequisites.—For graduate work in the Institute of Child Welfare, students are normally expected to have had the equivalent of an undergraduate major in either psychology, sociology, education, or home economics. Aside from or including the major, the student normally is expected to have had at least 10 hours in psychology, 8 hours in sociology, and 3 hours in statistics. In special cases or where the background lies in other fields, such as nursing or medicine, adjustments may be made.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 120s. Health Care of the Young Child. Physical care, illnesses, prevention of disease, and health problems of the young child, primarily for nursery school teachers and those in charge of groups of children and for parental education workers. Two credits. Sr., grad. and permission of instructor; T V, and 1 hr. ar.; 202Pt. Dr. Boyd.
- 130s. The Development of the Young Child. An advanced course dealing with the development of the pre-school child from the anatomical, physiological, psychological, educational, and social aspects. Lectures, readings in the experimental literature, and reports. Prerequisite: 12 credits in psychology or equivalent, and permission of instructor. Three credits. MWF I; 202Pt. Mr. Anderson.
- 133f-134w-135s. Observational and Experimental Methods in the Study of the Development of the Young Child. The various methods and techniques such as growth records, mental tests, ratings, controlled observations, etc., used in the experimental study of the young child. Practical exercises and problems on institute records and data will be

- given. Prerequisite: 10 credits in psychology or educational psychology, including one laboratory course, or the equivalent, and permission of instructor. Six to nine credits. M VI, WF VI-VII; 202Pt. Miss Goodenough, Miss Shirley.
- 170f. Parental Education in Child Care and Training. A consideration of the content and methods used in courses and study groups for parents in the care and training of young children. Lectures, discussions, and reports. Prerequisite: 15 credits in education, or psychology or sociology, or preventive medicine. Three credits. MWF III; 110P. Miss McGinnis.
- 173w-174s. Technique and Practice of Parental Education. Field work in the technique of organizing and conducting parental study groups and courses for the study of the young child. Prerequisite: C.W.I. 170 and permission of instructor. Six credits. Hrs. ar. 202Pt. Miss McGinnis.
- 190w-191s. Mental Examination of Pre-School Children. A study of the methods used in testing young children together with practice in such testing. Prerequisite: Ed. Psy. 143-144-145 or 134-135-136, or equivalent, and permission of instructor. Two or four credits. TTh III, 202Pt. Miss Goodenough.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 230-231-232. Seminar in the Development of the Young Child. Reviews of current literature, discussion of fundamental problems, and reports on research. Meetings in alternate weeks. Attendance of graduate students who are candidates for degrees is required. Prerequisite: permission of instructor. Three credits. Hrs. ar.; 202Pt. Mr. Anderson.
- 233-234-235. Research in the Development of the Young Child. Credits arranged. Mr. Anderson, Miss Goodenough.
- 250w. Nursery School Education. Discussion of historical background and current practices, fundamental problems and theory, problems of administration and organization. Prerequisite: permission of instructor. Three credits. MWF; VIII; 202Pt. Mrs. Foster.

CIVIL ENGINEERING

Professors Frederic H. Bass, Alvin S. Cutler, Fred C. Lang, Frederick M. Mann, John I. Parcel; Associate Professor John V. Martenis; Assistant Professors Chester A. Hughes, Joseph A. Wise.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 161f. Hydrology. Rainfall, evaporation, transpiration, percolation, run-off. Flood and low water of streams. Storage for use in water supply, water power, irrigation, and navigation. Mass curves and frequency curves. Three credits. Mr. Bass.
- 162f,w. Water Supply and Sewerage. Sources of water supply; quality of water. Methods of testing, collection, distribution, and purification of water. Selection of pumping machinery and motive power. Sewer

- systems and sewage disposal works. Prerequisite: M.&M. 129. Three credits. Mr. Bass.
- 163w,s. Water Supply and Sewerage. Prerequisite: Course 162. Three credits. Mr. Bass.
- 164f,w,s. Water Power. Types of low, medium, and high head developments. Details of developments. Dams. Turbine settings and characteristics. Prerequisite: M.&M. 129. Three credits. Mr. Bass.
- 171w. Building Sanitation. Location and orientation of buildings; lighting, ventilation, water supply plumbing, sewage, and refuse disposal. Prerequisite: sr. arch. and grads. only. Two credits. WF II; 5E. Mr. Bass, Mr. Martenis.
- 172s. City Planning. Physical elements of the city; topography, drainage, geology. Public works and structures. Internal and external transportation. Zoning. Subsurface structures. Esthetic features of the city. Prerequisite: Course 52. Three to five credits. MWF III; 21E. Mr. Bass, Mr. Mann.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 261f-262w. Water and Sewage Purification. Design and water purification and sewage disposal works. Prerequisite: Course 163. Three to five credits. Mr. Bass.
- 280f-281w-282s. Civil Engineering Research. Original work in concrete, structural steel, hydraulics, municipal or transportation problems. Investigations, reports, tests, designs. Prerequisite: by permission. Five credits. Mr. Bass, Mr. Cutler, Mr. Lang, Mr. Parcel.

HIGHWAY ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 156w. Highway Transport. Development, economic field, relation to other forms of transportation. Highway transport surveys, economics of location, economics of selection of the type of surface, effect of vehicle on road and road on vehicle. Prerequisite: Course 52. Three credits. Mr. Lang.
- 157s. Highway Transport. Motor vehicle as a common carrier, analysis of road legislation, taxation. Principles of successful operation. Selling motor transportation. Prerequisite: Course 156. Three credits. Mr. Lang.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 251s. Highway Laboratory. Investigations in co-operation with State Highway Department. Prerequisite: Course 52. Three to five credits. Mr. Lang.
- 252s. Highway Design. Preparing of a plan and specification for short sections of highways and city streets, also making estimates of materials and cost. Prerequisite: Course 52. Three credits. Mr. Lang.

RAILWAY ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f. Railway Engineering. Train resistance, ruling and momentum grades. Curvature, distance, rise and fall as factors in location and operation of railroads. Train loading, acceleration, retardation; locomotives and equipment. Operating costs governing grade revision. Prerequisite: Course 23. Three credits. Mr. Cutler.
- 122w. Railway Engineering. Lectures, office work, and field inspection. Design and operation of various types of yards and terminals, and terminal facilities, including the hump, engine house, coal and water station. Signalling and interlocking. Prerequisite: Course 23. Three credits. Mr. Cutler.
- 123s. Railway Engineering. Design and construction of railroad buildings and structures; culverts, wooden trestles, switches, cross-overs, crossing frogs, etc. Earthwork, computation, estimates, and reports. Distribution of material by mass diagram. Prerequisite: Course 23. Three credits. Mr. Cutler.
- 124w. Transportation. Development of railway and inland waterway transport, railway regulation and control with special reference to the 1920 Railway Transportation Act, geographical, financial, and rate grouping of railways, Interstate Commerce Commission method of accounting. Cost and value of service, present systems, and organization. Prerequisite: Course 121. Three credits. Mr. Cutler.
- 125s. Transportation. Specific illustrative problems: Twin City and Mississippi Valley traffic situation, Mississippi River experiment, New York Barge Canal, Great Lakes traffic, Panama Canal status. Prerequisite: Course 122. Three credits. Mr. Cutler.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 221f-222w-223s. Railway Administration. Analysis of railway organization and methods of management and operation. Special problems. Prerequisite: Course 122. Three credits per quarter. Mr. Cutler.
- 224f. Railway Terminals and Yards. Continuation of Course 123. Prerequisite: Course 122. Three credits. Mr. Cutler.

STRUCTURAL ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 131w,su. Bridge Analysis. Stresses in simple span bridges of the larger type and in cantilevers, arches, and continuous bridges. Prerequisite: Course 134. Three credits. MTh VII-IX, F III-IV; 229E. Mr. Parcel.
- 132s,su. Bridge Design. Design and detail drawing of railway pin connected truss span. Prerequisite: Course 131. Three credits. M III-IV, VI-IX; 227E. Mr. Parcel.

- 134f,su. Statically Indeterminate Structures. General theory of deflections and statically indeterminate stresses and application to simple problems in continuous girders, frames, and arches. Prerequisites: Course 33 and M.&M. 128. Three credits. F VI, S I-II; 227E. Mr. Parcel.
- 135s,su. Reinforced Concrete Design. Analysis of structures as rigid frames. Application to reinforced concrete buildings. Effect of temperature and shrinkage. Effect of settlement of foundations. Prerequisite: Course 142 or 142a. Four credits. M II-III, F VI-IX; 217E. Mr. Wise.
- 141f,su. Reinforced Concrete. Principles of reinforced concrete. Theory of beams, slabs, and columns and the application to ordinary structures. Prerequisite: M.&M. 128. Three credits. Mr. Wise.
- 141(a)f,su. Reinforced Concrete. Similar to Course 141 with problems of special interest to students in architectural engineering. Prerequisite: M.&M. 128. Three credits. M VI-VII, T III-IV, F VIII-IX; 217E. Mr. Wise.
- 142w,su. Reinforced Concrete Design. Continuation of Course 141 with special emphasis on the practical features of the design of buildings, bridges, retaining walls, etc. Prerequisite: Course 141. Three credits. Mr. Wise.
- 142(a)w,su. Reinforced Concrete Design. Similar to Course 142 with problems of special interest to students in architectural engineering. Prerequisite: Course 141(a). Three credits. MT VIII-IX, F VI-VII; 227E. Mr. Wise.
- 143s. Reinforced Concrete Analysis. Advanced problems in design including reinforced concrete arch. Prerequisites: Courses 134 and 142. Three credits. Mr. Wise.
- 144f. Reinforced Concrete. (For students other than civil engineers.) Design of reinforced concrete beams, girders, and columns. Design of footings and foundations. Design of retaining walls. Form work. Mixing and placing concrete. Testing and inspection of concrete work. Prerequisites: M.&M. 84 and 128, or M.&M. 127 and 128. Three credits. MW IV, 215E; Th VIII-IX; 201E. Mr. Wise.
- 146f,w,s. Plain Concrete. Theory of design and control of concrete mixtures. Practice in control tests of concrete and concrete materials. Lectures and laboratory work. Prerequisites: M.&M. 141. Three credits. Mr. C. A. Hughes.
- 147w. Foundations. Design and construction of footings, cofferdams, and caissons for bridges and buildings. Piers and abutments. Underpinnings of buildings. Exploration and testing of foundation sites. Excavation and removal of materials from foundation site. Prerequisite: M.&M. 128. Two credits. Mr. Wise.
- 148f-149w-150s. Advanced Concrete. Short research problems in concrete. Prerequisite: Course 146. Two credits. Mr. C. A. Hughes.
- 234f-235w-236s. Advanced Theory of Structures. Application of the theory of indeterminate stresses to the more complex problems in structural analysis. Continuous and swing bridges, simple and multiple arch and

- suspension systems. Wind stresses in tall building frames. Secondary stresses. Special problems. Mr. Parcel.
- 237w-238s. Structural Laboratory. Experimental problems in structural steel. Strain gauge study of actual stress distribution in beams, columns, and riveted joints. Prerequisite: Course 133. Three to five credits per quarter. Mr. C. A. Hughes.
- 245f-246w-247s. Seminar. Special topics in the higher theory of structures. Prerequisites: Courses 134, 142. Three to six credits per quarter; Mr. Parcel, Mr. Wise.

COMPARATIVE LITERATURE*

Professor Oscar W. Firkins.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Drama. An outline of the history of drama, including the drama of today. Nine credits. TThS III; 113F. Mr. Firkins.
- 105f-106w-107s. Principles of Criticism. Lectures and readings. Nine credits. MWF VI; 113F. Mr. Firkins.
- 110w. The International Romantic Movement in Europe (1775-1825). Three credits. TThS II; 113F. Mr. Firkins.
- 111s. The Novel in Europe, 1875-1925. Three credits. MWF II; 113F. Mr. Firkins.
- 203f. The Arthurian Legend: from Geoffrey of Monmouth to Tennyson and Wagner. Mr. Firkins.
- 206s. French and English Literary Criticism: from the sixteenth century to the present time. Mr. Firkins.

COMPOSITION

- 111f-112w-113s. Essay Writing. Practice in writing didactic, biographical, critical, and informal essays. Prerequisites: Courses 11-12 or 18-19, and 10 or 20. Nine credits. MWF III; 304F. Mr. Nichols.
- 119f-120w-121s. Seminar in Writing. Open to students who write with facility. Criticism of manuscripts submitted. Prerequisites: permission of instructor. Nine credits. Th VI, VII; 304F. Mrs. Phelan.

DAIRY HUSBANDRY

Professors Clarence H. Eckles, Willis B. Combs; Associate Professors Harold Macy, William E. Petersen.

Students taking major work in dairy husbandry for a Master's degree may be exempted from the language requirement.

Students desiring major work in dairy production should make arrangements with the Division of Dairy Husbandry previous to registration.

* Prerequisites for graduate work same as English language and literature.

Prerequisites.—For a major in *production* the adviser must be satisfied that the student has had sufficient preparation in chemistry, genetics, and animal physiology; for a major in *dairy products*, bacteriology, chemistry, physics, and economics; for a major in *dairy bacteriology*, chemistry, bacteriology, and dairy products.

When the preparation appears inadequate the adviser may require that additional courses be taken to make up the deficiencies. With the approval of the adviser, certain courses in agricultural biochemistry, bacteriology, genetics, and animal husbandry may be accepted as part of the major.

Due to the limitation of available animals and the cost of animal experiments, students desiring a major in dairy production are expected to make arrangements previous to enrolment.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Milk Production. Problems of the dairy farmer. Three credits. MTWFS IV; 210HH. Mr. Eckles.
- 102s. Market Milk. Lectures and laboratory work. Three credits. MW IV, Th VI, VII, VIII; 210HH. Mr. Macy.
- 103w. Dairy Stock Feeding. Application of the principles of nutrition to special problems of feeding the dairy cow and growing the young animals. Three credits. MWF III; 210HH. Mr. Eckles.
- 104s. Dairy Stock Selection. Practice in comparative judging; selection and valuation; visits to pure-bred herds. Three credits. MW VI, VII, VIII, F VI; 210HH. Mr. Petersen.
- 105f-106w-107s. Seminar. Special investigations and study of selected topics. Reports on assigned subjects and reviews of recent scientific investigations. Three credits. S II; 214HH. Mr. Eckles.
- 110w. Dairy Products III. Similar to Course 111f with special application to ice cream. Three credits. TS IV, T VI, VII, VIII; 210HH. Mr. Combs.
- 111f. Dairy Products I. The chemical, bacteriological, and economic problems in the manufacture and marketing of butter. Three credits. MW VI, F VI, VII, VIII; 210HH. Mr. Combs.
- 112s. Dairy Products II. Similar to Course 111f with special application to cheese, condensed and powdered milk. Three credits. TS IV, T VI, VII, VIII; 210HH. Mr. Combs.
- 113s. Technical Control. Chemical and bacteriological laboratory methods used in technical control of milk and its products. Three credits. TTh I, II, III; 102HH. Mr. Combs, Mr. Macy.
- 115su. Problems in Dairy Husbandry. A study of special problems in dairy husbandry. Open only to the teacher of agriculture and the extension worker. (See summer quarter bulletin.) 210HH. Mr. Petersen.
- 115s. Advanced Dairy Bacteriology. Investigations of specific problems in the bacteriology of milk and dairy products. Prerequisites: Course 2 or equiv., Course 111 or 112. Ar. Mr. Macy.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201w. Dairy Bacteriology. Lectures, assignments, laboratory work. Types of milk organisms, relation to the bacteria of milk to dairy manufacturers and to public health, the bacteriology of dairy products. Three credits. MWF VI, VII, VIII; 210HH. Mr. Macy.
- 202f-203w-204s-208su-210su. Research in Dairy Husbandry. Facilities offered for study and investigation of subjects pertaining to dairy cattle. Students are allowed to assist at times with investigations under way in the experiment station. Arranged to meet the needs of the individual student. Open in the summer quarter only to those who have had preliminary graduate work. Mr. Eckles, Mr. Petersen.
- 205f-206w-207s-209su-211su. Dairy Products. Opportunity and facilities are offered for study and investigation of problems concerning dairy products. The work is arranged to meet the needs of the individual student. Open in the summer quarter only to those who have had preliminary graduate work. Mr. Eckles, Mr. Combs, Mr. Macy.

ECONOMICS

Professors Russell A. Stevenson, Roy G. Blakey, George Filipetti, Fred-eric B. Garver, Alvin H. Hansen, Arthur W. Marget, Bruce D. Mudg-ett, J. Warren Stehman, Roland S. Vaile; Associate Professors Ernest A. Heilman, John J. Reighard, Clare L. Rotzel; Assistant Professors Arthur M. Borak, Ralph Cassady, Walter R. Myers, Harry J. Ost-lund, Emerson P. Schmidt, William H. Stead, Robert M. Weiden-hammer.

Candidates for higher degrees will be accepted as majors in economics in the following fields: money and banking, public finance, economic theory, economic history, labor statistics; in accounting, only for the Master's degree.

GENERAL ECONOMICS AND BUSINESS ADMINISTRATION

Prerequisites.—For major work, 27 quarter credits for those offering Economics 1A, 1B and 3, or their equivalent; 18 quarter credits for those not presenting Economics 1A and 1B or an equivalent. These credits should include Money and Banking, Statistics, and Accounting. Candidates not presenting these fundamental courses upon registration in the Graduate School may be required to complete them in addition to the regular course requirements for the degree.

Majors and minors.—Major and minor work for the Master's degree may both be taken in economics if the candidate presents a program of courses properly complementing each other and not too closely related, if approved by the Executive Committee of the Graduate School. Agricultural economics, economic history, and accounting will usually be consid-ered satisfactory as majors or minors distinct from general economics.

Required courses.—All candidates for advanced degrees must complete Economics 103-104, or Economics 203-204, or the equivalent of either. Other courses will be required according to the field in which the candidate

is working. Ordinarily at least one full graduate seminar must be carried throughout the year.

Language requirement.—Candidates for the Master's degree in economics are required to have a reading knowledge of a foreign language only when the thesis is written in the following fields: money and banking, public finance, economic theory, economic history, and labor.

General Economics

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

NOTE.—The following courses in other departments carry credit also in Economics: 180-181-182. Topics in Economic History; 210-211-212, Graduate Seminar in Economic History. Political Science: 107, Recent Social Legislation; 109, Government and Business; 111, Law of Public Utilities.

Business Administration

- 100f,w,s. Report Writing. One credit. Fall, T VI, winter, T IV, spring, T VI; 6B.
- 101f-102w. Advanced General Economics. Six credits. Sec. 1, MWF III; Sec. 2, MWF IV; 102B. Mr. Garver.
- 101w-102s. Advanced General Economics. Six credits. TThS I; 102B. Mr. Garver.
- 107f. Advanced General Economics. Combined course. Five credits. MTWThF II; 209B. Mr. Garver.
- 109f,s. Business Policy. Three credits. Fall, MWF VII, spring, MWF II; 202B. Mr. Stevenson.
- 112f,w,s. Business Statistics. Three credits. Fall, Sec. 1, MWF II, Sec. 2, TThS III, 102B; winter, Sec. 1, MWF I, 303B, Sec. 2, MWF II, 102B; spring MWF II, 102B. Mr. Mudgett.
- 130f,s. Cost Accounting. General survey. Three credits. Fall, TThS I, 303B; spring, TThS I, 303B. Mr. Ostlund.
- 132f,s. Cost Accounting. Five credits. MTWThF II; 303B. Mr. Ostlund.
- 133s. Cost Accounting Systems. Three credits. TThS II; 6B. Mr. Ostlund.
- 134f. Income Tax Accounting. Three credits. MWF I; 302B. Mr. Reighard.
- 135f-136s. Auditing. Six credits. MWF III; 301B. Mr. Reighard.
- 138f,s. Accounting Practice and Procedure. Five credits. Fall, MTWThF III, 303B; spring, MTWThF III, 302B. Mr. Heilman.
- 139f,w,s. Advanced General Accounting. Three credits. Fall, MWF IV, 303B; winter, Sec. 1, MWF III, 301B, Sec. 2, MWF VI, 303B; spring, MWF IV, 302B. Mr. Heilman.
- 142f,w,s. Money and Banking—Advanced Course. Three credits. Fall, Sec. 1, MWF II, Sec. 2, MWF VI, 6B; winter, Sec. 1, TThS II, 6B, Sec. 2 MWF IV, 303B; spring, TThS II, 209B. Mr. Marget, Mr. Myers.
- 145s. Foreign Exchange. Three credits. MWF IV; 303B. Mr. Myers.
- 146f. Investments. Three credits. MWF VI; 102B. Mr. Weidenhammer.

- 147s. Bank Administration. Three credits. MWF I; 6B. Mr. Marget.
 148w. The Securities Market. Three credits. TThS II; 202B. Mr. Weidenhammer.
 155f,w,s. Corporation Finance. Three credits. MWF III; 202B. Mr. Stehman.
 156f. Finance Management. Three credits. TThS I; 102B. Mr. Stehman.
 165f,w,s. The Economics of Public Utilities. Three credits. TThS III; fall, 202B; winter, 102B; spring, 202B. Mr. Garver.
 167w. Personnel Administration. Three credits. TThS I; 202B. Mr. Stead.
 168s. Advanced Personnel Administration. Three credits. TThS I; 209B. Mr. Stead.
 177w. Foreign Trade. Three credits. MWF I; 202B. Mr. Blakey.
 180f-181w-182s. Seminars for Seniors and Graduates. Intensive study of problems in respective fields of specialization. In 1931-32 they will be offered as follows:

No.	Title	Credits	Day	Hour	Bldg.	Instructor
A.	Accounting*	6	MWF	I	Ar	Mr. Reighard
B.	Business Finance	6	T	VII-VIII	209B	Mr. Stehman and others
C.	Marketing	9	TTh	VI-VII½	301B	Mr. Vaile and others
D.	Personnel	9	TTh	VI-VII½	302B	Mr. Stead
E.	Secretarial Practice*	6	MWF	IV	1B	Mr. Ostlund and others
F.	Statistics	9	Ar	Ar	Ar	Mr. Mudgett
G.	Production Management‡	9	MWF	VI	209B	Mr. Filipetti
H.	Insurance	3	Ar	Ar	Ar	
I.	Traffic Management‡	3	MWF	VIII	209B	

- 183f,w,s. Senior Practice Course. Three credits. Ar. Members of the staff.
 194f-195w-196s. Advanced Advertising Procedure. Three credits. F IV; 204B. Mr. Vaile.
 197f-198w-199s. Honors Course in Business Administration. Ar.

Economics

- 103f-104w. Value and Distribution. Six credits. MWF II; 204F. Mr. Garver.
 105s. History of Economic Ideas: The Classical Economists. Three credits. MWF VII; 102B. Mr. Garver.
 106s. History of Economic Ideas: The Critics of the Classical Economists. Three credits. Mr. Hansen.
 108w. Marketing Organization: Agricultural Products.
 113w-114s. Theory of Statistics. Six credits. MWF I; 102B. Mr. Mudgett.
 124f. Comparative Banking—British Systems. Three credits. MWF III; 302B. Mr. Myers.
 125w. Comparative Banking—European Systems. Three credits. MWF III; 6B. Mr. Myers.

* Winter and spring only.

‡ Spring only.

- 127s. Comparative Banking—South American Systems. Three credits. MWF II; 209B. Mr. Myers.
- 141f,w,s. Monetary and Banking Policy. Three credits. Fall, MWF I, 102B; winter, MWF I, 6B; spring, MWF VI, 6B. Mr. Marget, Mr. Myers.
- 149f,w,s. Business Cycles. Three credits. Fall, TThS I, 202B. Winter, Sec. 1, MWF I, 209B; Sec. 2, MWF VII, 102B. Spring, MWF III, 102B. Mr. Marget, Mr. Myers.
- 154s. Public Utilities. Three credits. TThS II; 202B. Mr. Garver.
- 160w. The Modern Corporation. Three credits. MWF IV; 6B. Mr. Stehman.
- 161f,w,s. Labor Problems and Trade Unionism. Three credits. Fall, MWF IV, 202B; winter, TThS III, 209B; spring, TThS III, 102B. Mr. Hansen, Mr. Stead.
- 162w. Labor Movements. Three credits. MWF IV; 202B. Mr. Hansen.
- 163w. Economic Aspects of Population and Immigration. TThS III; 202B. Mr. Hansen.
- 164s. Labor Legislation and Social Insurance. Three credits. TThS III; 209B. Mr. Stead.
- 166s. International Economic Problems. Three credits. MWF VII; 102B. Mr. Hansen.
- 172f. Economics of Transportation. Three credits. MWF VIII.
- 176f,s. Commercial Policies. Three credits. MWF I; 202B. Mr. Blakey.
- 187f-188w-189s. Honors Course in Economics. Ar.
- 191f-192w. Public Finance. Three credits. MWF III; 209B. Mr. Blakey.
- 193s. State and Local Taxation. Three credits. MWF III; 6B. Mr. Blakey.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 203f-204w. Seminar in Economic Theory. Six credits. MW VIII½-IX; 204B. Mr. Garver.
- 206s. Seminar in Market Prices. Three credits. MW VII-VIII½; 204B. Mr. Vaile.
- 243f-244w. Seminar in Money and Banking. Six credits. TF VIII; 204B. Mr. Marget.
- 248f-249w-250s. Seminar in Unemployment and Business Cycles. Six credits. Th 3:30-5:30; 204B. Mr. Hansen.

AGRICULTURAL ECONOMICS‡

Professors O. B. Jesness, Andrew Boss, Warren C. Waite; Associate Professors Edwin C. Johnson, George A. Pond; Assistant Professors Rex W. Cox, Lewis F. Garey.

Prerequisites.—For major work 18 quarter credits consisting of courses acceptable to the student's adviser. Further courses may be required if in the opinion of the adviser this is necessary.

‡ For courses in General Economics and Business Administration, see Economics.

Majors and minors.—The thesis may be in any field of agricultural economics (marketing, farm management, economics of agricultural production, agricultural prices, farm finance, land economics). Candidates will be expected to take work in the different fields, the program depending upon the field of specialization. With the approval of the adviser, certain courses in general economics and business administration may be accepted as major work. The minor may be in general economics.

Language requirement.—Candidates for the Master's degree in agricultural economics may be exempted from the requirement of a reading knowledge of a foreign language.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 102w. Farm Management: Organization. The business side of farming with emphasis on farm organization and equipment. Three credits. MW I, Th VII, VIII, 312HH. Mr. Garey.
- 103s. Farm Management: Operation. A continuation of 102 with special attention to farm operation. Prerequisite: Course 102. Three credits. MW I, Th VII, VIII; 312HH. Mr. Garey.
- 104s. Types of Farming. A study of types of farming and of prevailing farm practices in the principal agricultural production areas. Prerequisites: Courses 102, 103, or equiv. Three credits. MWF II; 311HH. (Offered in 1931-32 and alternate years thereafter.) Mr. Boss.
- 110f-111w. Economics of Agricultural Production. The principles of production economics elaborated in terms of the production of the major farm products and producing areas. Economic geography of agriculture. National production policies. Six credits. TThS I; 312HH. Mr. Johnson.
- 126s. Economics of Consumption. Formulation of the economic principles relating to choice between different uses of income and time and energy of individuals and family organizations. Three credits. MWF I, 109HH; MWF II, 109HH. Mr. Waite.
- 131w. Market Prices. Analysis of the price making process as it works out in the market places where the major farm products are sold. Market quotations and price quoting. Three credits. TThS III; 312HH. Mr. Waite.
- 135s. Methods of Price Analysis. Statistical technique involved in analyzing seasonal and year-to-year movements in prices of farm products. Interpretation of results. Three credits. TThS III; 312HH. Mr. Waite.
- 140f. Marketing Organization: Staples. Principles of production economics applied to the organization of markets and marketing organization for the grains, tobacco, cotton, and wool. Especial attention to co-operative organization. Three credits. MWF II; 312HH. Mr. Johnson, Mr. Cox.
- 141w. Marketing Organization: Dairy and Poultry Products. Three credits. TThS II; 312HH. Mr. Jesness.
- 142s. Marketing Organization: Fruits and Vegetables. Two credits. MW III; 312HH. Mr. Cox.

- 143w. Marketing Organization: Livestock and Meats. Three credits. MWF III; 312HH. Mr. Johnson.
- 144f. Co-operative Organization. Three credits. TThS II; 312HH. Mr. Jesness.
- 150s. Advanced Farm Finance. Three credits. WF VI-VII½; 312HH. Mr. Johnson.
- 170s. Land Economics. Three credits. TTh VII-VIII½; 302HH. Mr. Johnson.
- 190f. Agricultural Statistics. Intended for beginning graduate students who have had no course in the elements of statistical method. Three credits. TThS III and two lab. periods ar.; 312HH. Mrs. Kittredge.
- 191w. Advanced Agricultural Statistics. Three credits. MWF IV; 312HH. Mrs. Kittredge.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f-201w-202s. General Seminar in Agricultural Economics.* Credits ar. Mr. Jesness and staff.
- 203f-204w. Current Problems and Literature. No credits. Required of all majors in agricultural economics. F IX; 312HH. Mr. Jesness.
- 206s. Seminar in Agricultural Policy. A study of economic problems of agriculture and policies adopted by governmental, agricultural, and individual agencies toward such problems. Three credits. MF VIII-IX½; 312HH. Mr. Jesness.
- 220s. Farm Surveys. An intensive study of the factors entering into farm organization. Special emphasis on selection, assembling, validity, and analysis of data. Attention given to studies in local production areas. Three credits. Ar. Mr. Garey.
- 221f. Farm Organization Studies. A seminar study of the principles involved in the analysis of farm organization data and the computation of farm costs. Attention will be given to methods used in collecting and compiling these data with special emphasis on farm records and accounts as a basis for farm organization study. Three credits. Mr. Pond.
- 223f-224w. Systems of Farming. A seminar course, including an intensive study of the factors determining the various systems of farming and production areas, with emphasis on specific types of farming. Three to six credits. Ar. Mr. Boss, Mr. Garey.
- 225w-226s. Advanced Farm Organization. Analysis of farm organization and the application of survey factors and cost factors in organizing the business of farming. Three to six credits. Ar. Mr. Boss, Mr. Pond.
230. Research Problems in Farm Organization and Operation. A study of methods of conducting research work and analyzing problems in farm organization and operation. Students will be assigned to individual research problems or to special phases of research work being conducted by members of the staff. Reports covering progress of work

* Under this head are arranged special seminars on subjects suited to the needs of the particular groups of graduate students, or on subjects upon which members of the staff are doing work at the time.

- and analysis of findings required as a basis for credit. Three to nine credits. Mr. Boss, Mr. Pond.
- 237w. Seminar in Research Methods in Price Analysis. A survey and analysis of the various types of research projects being worked upon in the field of prices of farm products. Three credits. MF VI-VII; 312HH. Mr. Waite.
- 240s. Seminar in the Marketing of Cereals. Three credits. MF VI-VII½; 312HH. (Offered in 1932-33 and in alternate years thereafter.) Mr. Jesness.
- 241f. Seminar in the Marketing of Livestock and Livestock Products. Three credits. MF VI-VII½; 312HH. (Offered in 1931-32 and in alternate years thereafter.) Mr. Jesness, Mr. Johnson.
- 244w. Seminar in Co-operative Marketing. Three credits. TTh VI-VII½; 311HH. (Offered in 1931-32 and in alternate years thereafter.) Mr. Jesness.
246. Seminar in Economics of Consumption. Ar.
- 247f. Seminar in Research Methods in Marketing. Three credits. MF VI-VII½; 312HH. Mr. Jesness.
- 251w. Seminar in Transportation of Farm Products. Consideration of special topics, such as rural highway economics, incidence of transportation costs of farm products. Ar.
- 265f. Seminar in Agricultural Taxation. Three credits. Ar.

EDUCATION

Professors Leo J. Brueckner, Harl R. Douglass, Fred Engelhardt, Albert M. Field, Melvin E. Haggerty, August Charles Krey, Wylle B. McNeal, Wilford S. Miller, Homer J. Smith, Ashley V. Storm; Associate Professors Charles W. Boardman, Clara M. Brown, Ross L. Finney; Assistant Professors Wesley E. Peik, John G. Rockwell, Dora V. Smith, Marvin J. Van Wagenen; Professorial Lecturers Anne D. Blitz, Herbert E. Chamberlain.

Prerequisites.—For major work at least six quarter credits in psychology and in addition to this a total of not less than 18 quarter credits of undergraduate work in education, which shall include Ed.Psy. 55 and Ed.Psy. 60 or equivalent. For minor work at least six quarter credits in psychology and in addition to this, a total of not less than 18 quarter credits of undergraduate work in education. Credit for seminar courses is not allowed.

Exemption from the language requirement for the Master's degree may be made in individual cases.

MAJORS AND MINORS

Major and minor work for advanced degrees may be arranged from courses listed below under the following groupings:

Doctor's Degree

Major.—Major may be designated as follows:

1. Educational administration and supervision.
2. Educational psychology.
3. Education. (Under this designation the student, with the approval of his adviser, may select a group of courses from among those listed below, excluding the field of his minor, centering about his special interest in education. The following are typical centers of interest: agricultural education, elementary education, history of education, home economics education, industrial education, techniques of instruction, secondary education, higher education.)

Minor.—Minors may be designated as follows:

1. Any other field of study offered in the University of Minnesota in which satisfactory courses of graduate character are available and which is obviously related to the major subject.
2. Students majoring in fields other than education may choose education or any of its subdivisions enumerated above as a minor when it appears that such a minor is appropriately related to the major field.

Master's Degree

Major.—Majors may be chosen as follows:

1. Educational administration and supervision.
2. Educational psychology.
3. Education. (Under this designation the student, with the approval of his adviser, may select a group of courses from among those listed below, excluding the field of this minor, centering about his special interest in education. The following are typical centers of interest: agricultural education, elementary education, history of education, home economics education, industrial education, techniques of instruction, secondary education, higher education.)

Minor.—Minors may be chosen as follows:

1. Educational administration and supervision.
2. Educational psychology.
3. Education. (Under this designation the student, with the approval of his instructor, may select a group of courses from those listed, excluding the field of his major, centering about his special interest in education. Typical centers of interest are listed above under Major.)
4. Any other field of study offered at the University of Minnesota in which satisfactory courses of graduate character are available and which is obviously related to the major field.

5. Students majoring in fields other than education may choose education or any of its subdivisions enumerated above as a minor when it appears that such a minor is appropriately related to the major field.

Program of classes.—For the schedule of classes for the year, including hours and place see College of Education bulletin, Part II. For descriptions of prerequisite courses see College of Education bulletin, Part I.

GENERAL COURSES

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ed.199su. Organization and Supervision of Vocational Education. A general course to consider objectives, methods, operation, and supervision of vocational education in the public schools, with special emphasis on agricultural education. Especially for superintendents, principals, and supervisors of vocational education. Prerequisite: Ed. T15 or equiv. Three credits. Mr. Field.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.208f. Methods in Educational Research. A study of the methods employed in treatment and presentation of educational problems. Designed to aid students in the preparation of theses. Suggested for all candidates for degrees. Two credits. S I, II; ar. Mr. Johnson.
- Ed.228f-229w-230s. Problems of College Education. Fall term: Problems of Student Personnel. Winter term: Problems of College Curricula and Instruction. Spring term: Problems of Organization and Administration. The course will consist of discussions and lectures by members of the university staff. May be taken for credit by graduate students. Six credits. Ar. Mr. Haggerty.

ADMINISTRATION AND SUPERVISION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ed.Ad.113f. High School Curriculum. A study of methods of curriculum making, types of programs of study, curricula, subjects of study, constants, variables, electives, distribution of subject-matter by years and units. Prerequisites: 10 hrs. in education including Ed.Psy.55. Three credits. MWF II; 111Ed. Mr. Benjamin.
- Ed.Ad.115. Organization of the Elementary School. Problems relating to the organization for instruction and classification of pupils in elementary schools with critical examination of current practices. S III, IV. Mr. Cooper.
- Ed.Ad.119f. The Elementary School Curriculum. A study of the principles underlying the selection and organization of subject-matter for courses in the elementary school; survey of scientific methods of curriculum

- making; examination of curricula, syllabi, and texts in the light of their function; survey of the findings of research by subjects. Prerequisites: 9 hrs. in education including Ed.Psy. 55. Two credits. S III, IV; 100Pt. Mr. Peik.
- Ed.Ad.119T-120T. Elementary School Curriculum. (Same as above for teachers.) Four credits. (Not offered 1931-32.)
- Ed.Ad.121W. Educational Advising of Women and Girls. A course designed to acquaint students with the problems of educational advising of girls and young women, particularly those of high school age. Students admitted to the course through conference with instructor. Prerequisite: 15 cred. in education and psychology. Three credits. MWF VIII. Miss Blitz.
- Ed.Ad.123w. Supervision of High School Instruction. The present status of high school supervision; its proper scope and function. A course combining consideration of principles and their application to improving high school instruction in the academic and special subjects. Prerequisites: 10 hrs. in education. Three credits. MWF II; 100Pt. Mr. Boardman.
- Ed.Ad.124f. Public School Administration. The organization, administration, and general support of public schools in states and local school districts. Prerequisite: 10 hrs. in education. Three credits. MWF IX; 210Bu. Mr. Engelhardt.
- Ed.Ad.125w. Techniques in Administration. Standard practices regarding child accounting problems, records and reports; procedures having to do with personnel and school board relations and rules and regulations; standard office practices, including textbook and supply management. Prerequisite: Ed.Ad. 124. Three credits. MWF IX; 210Bu. Mr. Engelhardt.
- Ed.Ad.126s. School Plant Management. Plant program planning and financing, including operation and maintenance of public school buildings. Prerequisites: Ed.Ad. 124, 125. Three credits. MWF X; 210Bu. Mr. Engelhardt.
- Ed.Ad.127. The City School Superintendent. A practical consideration of the duties of the superintendent: history; qualifications; present status; relations to the board of education, the staff, the pupils, and the public; types of administrative procedures; records; reports; professional ethics. Prerequisite: 10 hrs. in education. Two credits. (Not offered in 1931-32.)
- Ed.Ad.128f,w,s. Special Problems in Educational Administration. This course is designed primarily for superintendents and principals qualified to make intensive studies of specific problems related to the administration of a school system. Prerequisite: Ed. 124-125-126 or equiv. One or two credits. S; 224Bu. Mr. Engelhardt.
- Ed.Ad.133w. Guidance in Secondary Schools. Emphasizes practices in educational and vocational guidance in junior and senior high schools, considering such phases as giving information about vocations, utilizing

- test results and school marks, and organizing the staff for guidance. Prerequisite: 10 hrs. in education including Ed.Psy. 55. Two credits. S I, II; 205aEd. Miss Merrill.
- Ed.Ad.150f. Supervision and Improvement of Instruction. An analysis of the functions and duties of a supervisor as related to the improvement of instruction; specific supervisory technique; objective analysis of classroom activity; concrete applications to present day problems; case studies. Prerequisite: Ed.T. 15 or equiv. Three credits. MWF III; 100Pt. Mr. Brueckner.
- Ed.Ad.151w. Supervision—Uses of Educational Tests in Improving Instruction. Objective evaluation of the results of teaching; diagnosis of pupil difficulty; remedial work; tests as aids to teaching; following up a testing program. Prerequisite: Ed.T. 15 or equiv. Two credits. S III, IV; 205aEd. Mr. Brueckner.
- Ed.Ad.152w. Supervision—The Adjustment of Schools to Individual Differences. The adaptation of the school, the curriculum, and classroom procedures to the abilities and interests of pupils. Typical provisions; classification, emphasis upon classroom procedure; survey of the evidence. Prerequisites: 15 hrs. in education. Two credits. Th IX, X; 210Bu. Mr. Peik.
- Ed.Ad.153s. Supervision of English in the Elementary Schools. Improvement of instruction in language, grammar, spelling, and handwriting; the results of scientific investigation; use of standardized and informal tests; remedial work. Prerequisite: Ed.T. 15 or equiv. Two credits. T IX, X; 100Pt. Mr. Brueckner.
- Ed.Ad.154s. Supervision of Social Sciences in the Elementary Schools. The scientific work being done on the course of study; in geography, history, science, and related fields; improvement of instruction in social sciences in the elementary schools. Prerequisite: Ed.T. 15 or equiv. Two credits. S III, IV; 100Pt. Mr. Brueckner.
- Ed.Ad.155f. Supervision of Arithmetic in the Elementary Schools. The improvement of instruction in arithmetic; the evaluation of the course of study; standardized drill exercises; diagnosis of specific pupil difficulty and remedial work; tests as aids of teaching. Prerequisite: Ed.T. 15 or equiv. Two credits. S III, IV; 100Pt. Mr. Brueckner.
- Ed.Ad.156w.* Practice Supervision—Observation and field work. Classroom visitation in the University Elementary Demonstration School, the University High School, and other schools in or near the Twin Cities, followed by conferences. The application of supervisory techniques and follow up; social projects in supervision. Prerequisite: 15 hrs. in education, and permission of instructor. Three credits. TTh 9:30-11:30; ar. Mr. Peik, Mr. Cooper.
- Ed.Ad.157f,w,s. Practice in Supervision. Problems and practice in the supervision of instruction in the elementary schools of Minneapolis and St. Paul. Prerequisite: consent of instructor. Three credits a quarter. Mr. Brueckner, Mr. Cooper.

* A laboratory fee of \$1 per credit is charged for this course.

- Ed.Ad.158w. Organization for Supervision. The organization and the administration of a public school system for supervision, treating specifically the delegation and co-ordination of the supervisory responsibilities of all staff members associated in these activities. Two credits. S I, II; 224Bu. Mr. Engelhardt.
- Ed.Ad.159s. Supervision of Reading. The improvement of supervision and instruction in oral and silent reading; the testing program; remedial work; evaluation of courses of study and textbooks; results of scientific investigations; special problems for study. Prerequisite: 15 hrs. in education. (Not offered in 1931-32.)
- Ed.Ad.160w. Supervision of Elementary Subjects. A course considering the application of principles of supervision to improving instruction in the subjects of the elementary school. Prerequisite: Ed.Ad. 150. Two credits. T IX, X; 206Ed. Mr. Brueckner.
- Ed.Ad.161f,w,s. Special Problems in School Supervision. This course is designed primarily for principals, superintendents, and supervisors qualified to make intensive studies of specific problems related to the supervision of schools. Prerequisite: 10 hrs. in education including Ed.Psy.55. Two credits; ar. Mr. Brueckner.
- Ed.Ad.164s. High School Administration. Principles and techniques of the organization and administration of secondary school units; housing; selection and assigning of the staff; schedule making; public relations and publicity; organization of guidance and of extra-curricular activities; pupil, equipment, and internal fund accounting and related problems of administration; government; problems of administration and organization related to instruction. Prerequisite: 10 hrs. in education including Ed.Psy. 55. Three credits. TThS II; 210Bu. Mr. Douglass.
- Ed.Ad.167f-168w. The Junior High School. An introduction to the theory and practice of junior high school education; sources of the movement for reorganization; purposes, functions, and limitations; types of reorganization; fundamental problems of reorganization, and administration and teaching; reorganization of subject-matter in grades 7, 8, and 9. Prerequisite: 10 hrs. in education, including Ed.Psy. 55. Four credits. W IX, X. Mr. Douglass.
- Ed.Ad.169f. Extra-Curricular Activities. Types of activities in junior and senior high schools; aims and values; practices in organizing, administering, and supervising; methods of evaluation. Prerequisite: 10 hrs. in education, including Ed.Psy. 55. Two credits. T IX, X; 210Bu. Mr. Benjamin.
- Ed.Ad.170f,w,s. Special Problems in Secondary Education. Planned primarily for those at work in high schools who are qualified to make intensive studies relating to administration and supervision of secondary education. Consult instructor before registering. Prerequisite: 10 hrs. in education, including Ed.Psy. 55. Two credits. Mr. Benjamin, Mr. Douglass.
- Ed.Ad.172w. Curriculum and Course of Study Construction. A study of the techniques employed at the public school and college levels. Class

- and individual projects according to needs and interests. Prerequisite: 15 hrs. in education. Two credits. S I, II; 324Lib. Mr. Peik.
- Ed.Ad.175s. Financial Aspects of Public School Business Administration. Financial program planning, budgeting accounting, cost finding, income and expenditure control; and the preparation and analysis of financial reports. Prerequisites: Ed.Ad. 124, 125. Three credits. FS I, II; 111Ed. Mr. Engelhardt.
- Ed.Ad.178f. School Surveys. A study of the literature and methods of school surveys, as a basis for the investigation of practical problems in school administration and supervision. Three credits. MWF X; 224Bu. Mr. Engelhardt.
- Ed.Ad.180f,w,s.* Practice in High School Administration. Practical experience in problems of administration, pupil personnel, curriculum administration, extra-curricular activities, staff problems, program and schedule making, etc. Consult instructor before registering. Prerequisite: 10 hrs. in education including Ed.Ad.65. Two credits a quarter. Ar. Mr. Boardman.
- Ed.Ad.184f. Supervision of Practice Teaching. A course primarily for teachers engaged in the direction of practice teachers in secondary education. Two credits. S III, IV; 111Ed. Mr. Boardman.
- Ed.Ad.185f. The Professional Education of Teachers. A study of the present status and of the problems that relate to the institutional training of teachers. Emphasis upon: historical evolution of current practices; institutional organization and relationship; curricula; teachers' wages; the building of professional curricula; recent investigations and findings. Intended for critic teachers, practice teaching supervisors, directors and administrators in departments, schools and colleges of education, and high school teacher training directors. Prerequisite: 10 hrs. in education. Two credits; S I, II; 100Pt. Mr. Peik.
- Ed.Ad.186f,w. Special Problems in Teacher Training. Planned for those who have a special interest in this field. An intensive study of specific problems. Consult instructor before enrolling. Prerequisite: Ed.Ad. 185 or consent of instructor. Two credits; ar. Mr. Peik.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.Ad.205-206-207. Seminar in Educational Administration. No credit. Mr. Engelhardt.
- Ed.Ad.218-219-220. Seminar in Secondary School Problems. No credit. Mr. Benjamin, Mr. Douglass, Mr. Boardman.
- Ed.Ad.225-226-227. Seminar in Elementary School Problems. No credit. Mr. Brueckner, Mr. Peik.

AGRICULTURAL EDUCATION

Prerequisites.—For major or minor work, 18 credits in agricultural education and preparation in agricultural subjects satisfactory to the Department of Agricultural Education.

* A laboratory fee of \$1 per credit is charged for this course.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 135s. The Curriculum in Vocational Agriculture. A study of curriculum organization, determination of subject-matter, organization of subject-matter, job analysis, course construction, texts, and references. Prerequisite: Ag.Ed. 11. Three credits. Mr. Field.
- 141f. Supervised Practice in Vocational Agriculture. A special methods course dealing with the selection, planning, supervising, and summarizing of the practical work in agriculture. Special emphasis on the problem method of teaching and the use of the farm and community for teaching purposes. Prerequisite: Ag.Ed. 11. Three credits. Ar. Mr. Field.
- 144w. Course Organization and Instruction for the Individual in Vocational Agriculture. Subject-matter content for the individual should be based on farm activities. Individuals should progress according to abilities and needs. Accepting these principles, this course includes selection and organization of content, administration, and teaching technique. Prerequisites: Ag.Ed. 11, 181, 182, 183. Two credits. Ar.
- 154f,w. Rural Education and Community Leadership. The rural school as a community center, and ways and means of organizing educational and recreational activities, such as clubs, festivals, fairs, and other desirable features of rural community life. Prerequisite: Ag.Ed. 11. Three credits. TThS IV. Mr. Field.
161. Vocational Education in Agriculture. Vocational education as interpreted by current philosophical conceptions and theories. A study of the principles developed and established in agricultural education. Special emphasis on pre-vocational agriculture and vocational guidance. Lectures, discussions, and selected readings from the literature of each of the problems presented for discussion. Three credits. Ar.
162. The Basis of Vocational Teaching Technique. A course which includes an analysis of the philosophical, psychological, and other bases of teaching technique from the viewpoint of the teacher of vocational agriculture. Three credits. Ar.
164. Fundamentals of Agriculture. Emphasis on current problems in meats, milk, poultry, plant pathology, mechanical training, and other essentials for teachers of agriculture. Three credits. Ar.
- 171w,s. Problems in Procedure. For agriculture teachers. Emphasizes working out problems in detail in order that the processes as formulated can be used in teaching the following year by those enrolled. Discussions, readings, papers, laboratory. Prerequisites: Ag.Ed. 11, 181, 182, 183, or equiv. Three credits. Ar. Mr. Field.
- 176s. Problems in Visual Presentation. Special attention to use of visual aids in teaching agriculture. The development of proper visual methods by means of research. Prerequisite: Ag.Ed. 75. Three credits. Ar. Mr. Field.
- 181f-182w-183s. Teaching Agriculture. A study of all activities of the teacher in conducting a high school agriculture department in Minne-

sota including all day, part time, evening, and elementary classes, and community activities. Observation, participation, reading, preparing plans, criticisms, discussions, reports. Prerequisite: Ag.Ed. 11. Fifteen credits. MTWThF III. Mr. Field.

191-192-193. Seminar in Agricultural Education. Critical studies of important problems in agricultural education; opportunity for individual investigation and research; review and interpretation of current educational literature. Two to six credits. Mr. Storm, Mr. Field.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. Advanced Seminar. Study of the broader administrative problems and policies in the field of agricultural education. Opportunity for independent investigation and research. One to two credits per quarter. 202Ad(F). Mr. Storm, Mr. Field.

221f-222w-223s-224su. Graduate Problems. Making investigations, gathering data, and formulating plans regarding agricultural education. Three credits per quarter. 207Ad(F). Mr. Storm, Mr. Field.

241f. Operation of Vocational Agriculture. Problems involved in the state and local activities in conducting vocational agriculture. It includes a study of federal and state laws and regulations, courses of study, duties of the state supervisor, reports, records, and conferences. Two credits. Ar.; 202Ad(F). Mr. Storm, Mr. Field.

242w,s. Organization and Administration of Teacher Training for Vocational Agriculture. Development of teacher training institutions, agricultural college curricula, professional needs of high school teachers, professional courses and their content, equipment, itinerant teacher training, practice teaching, teacher evaluation. Two credits. Ar.; 202Ad(F). Mr. Storm, Mr. Field.

243su. Same as Course 242 with the addition of concrete studies of specific institutions. Not open to students having credit for 242. Three credits. Ar.; 202Ad(F). Mr. Storm, Mr. Field.

SPECIAL SUMMER QUARTER COURSES FOR TEACHERS OF AGRICULTURE

By special arrangement, two courses of three credits each have been divided into halves, A and B, each of three weeks' duration during the summer quarter and each carrying 1½ credits. The maximum student load of these half courses during the three weeks' period, is three 1½-credit courses. Credit in each of these "A" courses will be suspended until the student finishes the "B" portions of the same course.

161Asu. Vocational Education in Agriculture. Vocational education as interpreted by current philosophical conceptions and theories. A study of the principles developed and established in agricultural education. Special emphasis on prevocational agriculture and vocational guidance. Lectures, discussions, and selected readings from the literature of each of the problems presented for discussion. One and one-half credits on completion of Ag.Ed. 161B. Mr. Storm, Mr. Field.

161Bsu. Continuation of 161Asu.

231Asu. Theory and Practice of Teaching Agriculture. A special course designed for teachers in service in agriculture. A functional analysis of current problems in developing the course of study in agriculture, farm practice work, and evening school instruction. Modern trends in educational theory and practice treated to meet the peculiar needs of individual teachers. One and one-half credits on completion of Ag.Ed. 231B. Mr. Storm, Mr. Field.

231Bsu. Continuation of 231Asu.

EDUCATIONAL PSYCHOLOGY

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

Ed.Psy.111Tf-112Tw. Educational Measurements in the Elementary School. The typical educational problems involving educational scales and standard tests. Nature of tests, methods of use, analysis of results obtained, and programs of remedial educational procedure based on the results of the tests. For teachers. Prerequisite: Ed.Psy. 55 or equiv. Four credits. S III, IV; 205bEd. Mr. Van Wagenen.

Ed.Psy.111s. Same as above. Three credits. MWF II; 109Psy. Mr. Van Wagenen.

Ed.Psy.113f-114w-115s. Psychology of Elementary School Subjects. A discussion of the research studies in the field of the psychology of elementary school subjects. Prerequisite: 10 cred. in education and psychology. Two credits. W IX, X. 109Psy. Mr. Van Wagenen.

Ed.Psy.116w-117s. Advanced Statistical Methods in Education. A survey of statistical studies in education with special reference to the methods employed and the reliability of the results obtained. Prerequisite: Ed.Psy. 60 or equiv. Four credits. T IX, X; 115Psy. Mr. Van Wagenen.

Ed.Psy.133. Systematic Educational Psychology. Advanced course covering the field of psychology as related to education. Prerequisite: 15 cred. in education and psychology. Four credits. (Not offered 1931-32.)

Ed.Psy.134f. Mental Tests. A laboratory study of group mental tests used in the kindergarten, elementary school, high school, and college with special emphasis upon their reliability and validity as instruments for educational guidance. Prerequisites: Ed.Psy. 55 and 60 or equiv. Two credits. MW VII, VIII; 211Psy. Mr. Eurich.

Ed.Psy.135w-136s. Problems in Mental Testing. A study of the practical problems of mental testing in the public schools with special reference to the administration of group mental tests. Projects involving testing and classification of pupils. Prerequisites: Ed.Psy. 55 and 60 or equiv. and 134. Four credits. MW VII, VIII; 211Psy. Mr. Eurich.

Ed.Psy.138f-139w.† Experimental Educational Psychology. A laboratory course designed to train students in the use of experimental methods in the study of educational problems, particularly in the field of the

- psychology of learning. It is suggested that this course supplement either 133 or 190, 191, 192, 193-194. Prerequisite: Ed.Psy. 55 or equiv. Four credits. WF IX, X; 116Psy. Mr. Rockwell.
- Ed.Psy.141. Psychology of Speech Disorders.
- Ed.Psy.143f-144w.† Individual Mental Examination. For teachers of sub-normal children. Demonstration and practice in mental diagnosis. Careful study will be made of different groups and systems of mental tests, and other clinical methods with discussion of general theory involved. Prerequisites: Ed.Psy. 55 and 134, permission of instructor. Four credits. TTh IX, X; 109Psy. Mr. Rockwell.
- Ed.Psy.145s. Special Problems in the Field of Individual Mental Testing. Prerequisite: Ed. Psy. 143-144. Two credits. Ar. Mr. Rockwell.
- Ed.Psy.146w-147s†. Child Guidance. Specific problems in school adjustment dependent upon physical and emotional factors of the child, the home, and the environment. Case records giving family and personal histories, physical condition, psychometric rating, and personality presented. Class discussion of the recommendations. Prerequisite: 15 credits in psychology and education. Four credits. S III, IV; Pt Aud. Mr. Chamberlain.
- Ed.Psy.149f-150w†-151s. Psycho-Educational Clinic. Conducted in cooperation with existing clinics and agencies in the Twin Cities. Students will receive practice in giving psychological examinations, in case study, and in scientific interpretation of data. Two to six credits. Prerequisites: 134-135-136, 144-145 or 184, 111, permission of instructor. Ar. Mr. Eurich.
- Ed.Psy.153f-154w-155s. Research Problems. Intended for properly prepared students who desire to pursue special investigation in the field of educational psychology. Ar. Mr. Haggerty, Mr. Miller, Mr. Eurich, Mr. Rockwell, Mr. Van Wagenen.
- Ed.Psy.157s. Psychology of Child Development. The physical, mental, social, and emotional development of children from birth to adolescence. Prerequisite: 6 credits in psychology. Four credits. S I, II. 112Ed. Mr. Carroll.
- Ed.Psy.158f. Psychology of Adolescence. A study of the physical and mental changes that characterize the transition from childhood to adult life. Implications for educational guidance during the period of secondary education. Prerequisite: Ed.Psy. 55 or equiv. Three credits. MWF VII. 210Bu. Miss Merrill.
- Ed.Psy.159s. Psychology of Personality. Theoretical basis. Survey of methods for the measurement and study of character and the emotions. Relation to school success and other factors in the school situation. Genetic development of personality traits in childhood and adolescence. Prerequisites: Ed.Psy. 55 or equiv. Three credits. (Not offered 1931-32.)
- Ed.Psy.181f,w,s. Practice in Personnel Work. Course designed to give properly qualified students practical experience in the use of psycho-

- logical and related methods in dealing with school children. Prerequisite: satisfactory preparation in psychology and education and approval of adviser. Ar. Mr. Haggerty, Miss Merrill.
- Ed.Psy.183s. Psychology of Gifted Children. A study of the physical and mental traits of gifted children and the methods of their education. Prerequisite: Ed.Psy. 55 or equiv. Two credits. TTh III; 210Bu. Mr. Carroll.
- Ed.Psy.184s. Mental Deficiency. Survey of mental deficiency in children and adults. Physical traits, including study of brain defects, causes and heredity; psychology of mental deficiency; social problems of feeble-mindedness. Subjects treated with reference to the training of defectives. Prerequisite: Ed.Psy. 55 or equiv. Two credits. S III, IV; 210Ed. Mr. Rockwell.
- Ed.Psy.189f. The Human Organism. The development of the human organism in relation to educational practice. Prerequisite: permission of instructor. Three credits. MWF IV. Ar. Mr. Rockwell.
- Ed.Psy.190f. Original Nature of Man. Advanced work in genetic psychology, man's unlearned behavior, and inherited capacities. Prerequisites: Ed.Psy. 55 and 60 or equiv. and permission of instructor. Three credits. MWF III; 301Psy. Mr. Miller.
- Ed.Psy.191w. Individual Differences. A study of group and individual differences and their relations to educational practice. Prerequisites: Ed.Psy. 55 and 60 and permission of instructor. Three credits. MWF III; 301Psy. Mr. Miller.
- Ed.Psy.192s. Recent Literature in Educational Psychology. Readings and reports on problems in educational psychology. Prerequisites: Ed.Psy. 55 and 60 and permission of instructor. Three credits. MWF III; 301Psy. Mr. Miller.
- Ed.Psy.193w-194s. Psychology of Learning. A study of the experiments in learning in the laboratory and in the classroom. Prerequisite: 12 credits in psychology and educational psychology. Four credits. TTh II; 301Psy. Mr. Rockwell.
- Ed.Psy.197-198-109. Problems of Subnormality. Phases of subnormality studied intensively. Review of important literature and original investigation. Students required to make reports on assigned topics and submit a paper on some problem at the close of the quarter. Six credits. (Not offered in 1931-32.)

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.Psy.201f-202w-203s. Seminar in Educational Psychology. A research course for graduate students. Required of all students writing theses in educational psychology. Does not carry credit as course work. Ar. Mr. Haggerty, Mr. Miller, Mr. Carroll, Mr. Eulich, Mr. Rockwell, Mr. Van Wagenen.

HISTORY AND PHILOSOPHY OF EDUCATION

- H.Ed.101f. Foundations of Modern Education. Historical analysis and interpretation of the more important elements in modern education derived from the Hebrews, Greeks, Romans, the Middle Ages, and the Renaissance. Prerequisite: 6 credits in psychology. Three credits. MWF VI; 210Bu. Miss Alexander.
- H.Ed.102w. History of Modern Secondary and Higher Education. A survey of existing types of American and European secondary and higher schools, followed by a historical study of their origin, aims, growth. Prerequisite: 6 credits in psychology. Three credits. MWF VI; 210Bu. Miss Alexander.
- H.Ed.103s. History of Modern Elementary Education. The institutions, theories, and problems of modern elementary education in the light of their history. Emphasis upon the rise of state systems and upon the history of modern educational reform. Not open to students who have had H.Ed.1. Prerequisite: 6 credits in psychology. Three credits. MWF VI; 210Bu. Miss Alexander.
- H.Ed.140w-141s. Topics in the History of Education. Historical investigation of educational problems. Prerequisite: permission of instructor. Ar. Mr. Krey, Mr. Wesley.
- H.Ed.287f-288w-289s. Problems in Educational Sociology. The sociological foundations of educational theory will be discussed with the investigation of specific problems. Lectures, readings, and problems. Prerequisite: permission of instructor. Two credits. T IX, X Mr. Finney.

HOME ECONOMICS EDUCATION

See Home Economics.

INDUSTRIAL EDUCATION

- Ind.101w. Tests in Industrial Subjects. Acquaintance with such available tests of aptitude and achievement as are useful in industrial education; giving and scoring of tests, with interpretation of results; application of known techniques in remedial teaching to the work of shop and drawing teachers, both general and vocational. Prerequisite: Ed.Psy. 55. Two credits. F IX, X; 112Bu. Mr. Smith.
- Ind.105w. Industrial Education. For superintendents, principals, and teachers not specializing in the field named; general and vocational phases considered; objectives, administration and supervision; programs and practices; laws, rulings, and standards for aid; significant literature; how to judge teachers, courses, and methods in the special field. Three credits. MWF IV; Ar. Mr. Smith.
- Ind.110f. Guidance in the Schools. The history of the educational and vocational guidance movement; typical public school means and methods; collection and use of occupational information; duties of the counsellor; organization and relationships. Prerequisite: Ed.Psy. 55. Two credits. S III, IV; 112Bu. Mr. Smith.

- Ind.150f-151w-152s. Problems in Vocational Education. Survey of printed reports and theses; critical analysis; selection of thesis problems; formulation of work plans; reports of progress; organization and presentation. Full year assumed. Graduates only. Six credits. W IX, X; 112Bu. Mr. Smith.
- Ind.170f. Day Industrial Schools. National, state, and local organization and types; buildings and equipment; promotion and advertising; co-operative relationships; teaching staff; pupil guidance, training, and placement. Two credits. M IX, X; 112Bu. Mr. Craigo.
- Ind.171w. Evening Industrial Schools. Development of the after training of adults; agencies and scope of the movement; national and state legislation; qualifications of instructors; problems and difficulties; records and certification, fees and charges; buildings, equipment, and instruction facilities; general versus unit-course organization. Two credits. M IX, X; 112Bu. Mr. Bass.
- Ind.172s. Administration of Part Time Schools. A study of the new movement for part time education; social and economic background; organization of classes, study of special student groups, courses of study; typical schools; comparative state legislation and plans; Minnesota's problems. Two credits. M IX, X; 112Bu. Mr. Smith.

THEORY AND PRACTICE OF TEACHING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ed.T.110s. Educational Diagnosis in Secondary Education. The application of educational measurements to the solution of the problems of high school instruction. Analysis of the specific learning processes involved in the various high school subjects; a critical survey of the means of diagnosing and alleviating high school pupils' learning difficulties; the use of educational measurements in improving high school teaching. Prerequisite: Ed.Psy. 55. Two credits. F IX, X; 205bEd. Mr. Carroll.
- Ed.T.122s. Literature for Adolescents. A background for pupil guidance in extensive reading in junior and senior high schools; analysis of studies of adolescent choices in literature; principles of selection; critical reading in broad field of literary, biographical, historical, scientific, and vocational interests of boys and girls. Prerequisites: Ed.T. 15 or jr.-sr. h.s. teaching experience. Two credits. W IX, X; UHS Lib. Miss Smith.
- Ed.T.143Tf-144Tw.† The Teaching of Reading. A study of the objectives, the materials, and teaching procedures in lower, intermediate, and upper grades in the light of the contributions of research; survey of current practices and curricula; class and individual projects; observation of reading techniques and materials in the demonstration school. Prerequisites: 9 hrs. in education including Ed.Psy. 55 or 56. Four credits. S I, II; 112Ed. Mr. Carroll.

- Ed.T.181f.‡ *Technique of Elementary School Instruction.* A critical study of the various types and methods of elementary classroom activity with emphasis upon the techniques and the function of the so-called newer methods. Observation in the demonstration school; class projects; survey of investigations and of the philosophic theories which are affecting progressive practice. Prerequisites: 10 hrs. in education including Ed.Psy. 55 or 56. Three credits. TTh II, III; ar. Mr. Peik, Mr. Cooper.
- Ed.T.181T-182T.†* *Technique of Elementary School Instruction.* (Same as Ed.T.181 above for teachers.) Four credits. (Not offered in 1931-32.)
- Ed.T.188s.* *Advanced Course in Methods of Teaching Modern Languages.* An advanced course of the seminar type in methods of teaching modern foreign languages. Designed primarily for experienced teachers and graduate students. Lectures, readings, discussion. Prerequisite: Ed.T. 76-77-78 or equiv. Two credits. Ar. Mrs. Sundeen.
- Ed.T.191s. *Advanced Course in the Teaching and Supervising of Secondary School Mathematics.* Evaluation, on the available scientific evidence, of present procedures in methods and content of junior and senior high school mathematics. Prerequisite: Ed.T. 115 or equiv. in teaching. Two credits. Ar.
- Ed.T.193f. *Foundations of Secondary School Methods.* A study of the investigations which form the bases of the technique of high school instruction and the application of their results to subject-matter and to classroom procedure. Each member will work primarily in the field of his teaching choice, with a final synthesis by the class as a whole. Prerequisite: Ed.T. 15. Three credits. T IX, X; 1 hr. ar; 202Ed. Mr. Johnson.
- Ed.T.194f.* *Advanced Course in Methods of Teaching English.* Evaluation of present practices in methods and content of junior and senior high school English courses in the light of the known results of scientific investigations in that field. Prerequisite: Ed.T. 15 and Ed.T. 49-50-51 or Ed.T. 52-53-54 or equiv. Two credits. S III, IV; 216Bu. Miss Smith.
- Ed.T.196w-197s.† *Special Problems in Techniques of Secondary School Instruction.* Opportunity is given in this course to work upon special research problems in the field of the student's individual choice under personal guidance of instructors in the given field. Individual conferences will replace class meetings throughout the course. Prerequisite: Ed.T. 15, *Special Methods in the Given Field*, Ed.Psy. 60 or equiv. Two credits a quarter. S III, IV; 216Bu. Miss Smith, Mr. Stokes, Mr. Wesley.

* A laboratory fee of \$1 per credit is charged for course.

† A fee of \$1 per credit is charged for this course.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.T.201f-202w-203s. Teaching of History and the Other Social Studies. Open only to graduate students who have had teaching experience. Consent of the instructor is necessary. Two credits per quarter. Ar.; ar. Mr. Krey, Mr. Wesley.
- Ed.T.222f-223w-224s. Seminar in Problems of High School Instruction. Th IX, X; 216Bu. Mr. Douglass, Mr. Johnson, Mr. Benjamin, Miss Smith, Mr. Stokes, Mr. Wesley.

See also Ed.T.228-229-230 under General Courses, page 58.

For graduate courses in the theory and practice of teaching in special subjects see the respective departmental course descriptions.

ELECTRICAL ENGINEERING

Professors John M. Bryant, William T. Ryan, Franklin W. Springer; Associate Professors Henry H. Hartig, John H. Kuhlman, James S. Webb; Assistant Professors Elmer W. Johnson, Milo E. Todd.

Prerequisites.—For major work, E.E. 121 to 126 or their equivalent; for minor work, 6 credits in physics, integral calculus, and one of the following: E.E. 38, 45, 48, or 125.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 111f-113w-115s. Electrical Engineering. Prerequisite: one year in college physics, four credits per quarter. Mr. Johnson.
- 112f-114w-116s. Electrical Engineering Laboratory. To be taken with Course 111-113-115. Two credits per quarter.
- 121f-123w-125s. Alternating Currents. Prerequisite: Course 115. Three credits per quarter. MWF 10:30 or 11:30. (Two sections.) Mr. Bryant, Mr. Johnson.
- 122f-124w-126s. Alternating Current Laboratory. To be taken with Course 121-123-125. Two credits per quarter.
- 127f. Transient Electrical Phenomena. Mathematical study of the electric circuit containing resistance, inductance, and capacity. Abnormal currents and voltage upon switching circuits containing iron core inductances. Prerequisite: Course 121. Three credits. Mr. Bryant.
- 128w. Transient Electrical Phenomena. Current and voltage distribution in circuits containing distributed resistance, inductance, and capacity. Distortion in telephone lines and its correction. Prerequisite: Course 127. Three credits. Mr. Bryant.
- 129s. Transient and High Frequency Phenomena. Transient phenomena in coupled circuits. Distribution of current and flux in conductors at high and low frequencies. Change of resistance with frequency. Theoretical study of special problems. Prerequisite: Course 128. Three credits. Mr. Bryant.

- 132f-134w-136s. Electrical Design. Prerequisite: Course 115. To be taken with Course 121-123-125. Two credits per quarter. Mr. Kuhlman.
- 138w-139s. Slow Transients. Short-circuit currents in power networks, unbalanced loads in polyphase circuits, transformers and motors, harmonics, stability of power systems under steady state conditions. Prerequisite: Registration in Course 123. Three credits per quarter. Mr. Bryant.
- 156s. Vacuum Tube Study. Two, three, four, and five electrode vacuum tubes. Thyration, kenotron, grid glow, photo electric tubes, etc. Theoretical study of apparatus and circuits with demonstrations. Two credits. Mr. Hartig, Mr. Webb.
- 183f-184w-185s. Electrical Laboratory. Efficiency tests and special problems. Prerequisite: Course 126. Credits as arranged.
- 186w or s. High Tension Testing. Low frequency pressure up to 320,000 volts and high frequency to several million volts applied to the study of dielectric phenomena, testing of high tension equipment, etc. Prerequisite: Course 124. Two credits. Mr. Springer.
- 191f-192w-193s. Seminar. Weekly discussion of current electrical periodicals. Prerequisite: Course 111. One credit per quarter.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 211f-212w-213s. Advanced Circuit Analysis. Circuit analysis using Heaviside's *Operational Calculus*. Prerequisite: M.&M. 151. Two credits per quarter. Mr. Hartig.
- 232f-234w-236s. Electrical Design. Special problems. Prerequisites: Courses 125, 136. Credits as arranged. Mr. Kuhlman.
- 275f-276w-277s. Electrical Engineering Research. Investigation of special research problems in laboratory or library. Prerequisite: Course 126. Two to four credits per quarter. Mr. Bryant, Mr. Ryan, Mr. Springer, Mr. Hartig, Mr. Kuhlman, Mr. Webb, Mr. Johnson, Mr. Todd.
- 284f-285w-286s. Precise Electrical Engineering Measurements. Lectures and laboratory work. Open to a limited number subject to approval. Prerequisites: Courses 123, 124. One or two credits. Mr. Todd.

ELECTRIC POWER

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 141f. Central Stations. Operation, design, and construction of electric power generating stations. Prerequisite: Course 115. Two credits. ThS 10:30. Mr. Ryan.
- 142w. Electrical Transmission. Prerequisite: Course 141. Two credits. ThS 10:30. Mr. Ryan.
- 144w. Railway Electrical Engineering. Prerequisite: Course 115 or 45. Two credits. MW 11:30. Mr. Johnson.
- 145s. Steam Railroad Electrification. Prerequisite: Course 144. Two credits. MW 11:30. Mr. Johnson.

- 149s. Protection Engineering. The application of relays, circuit breakers, lightning arrestors and other protective equipment to power circuits for apparatus protection and isolation of faults. Calculation of fault currents. Effect of fault condition on system stability. Prerequisite: registration in Course 125. Three credits. Mr. Johnson.
- 151f. Electric Lighting. Lectures, problems, and laboratory practice. Prerequisite: one year in college physics. One credit. Mr. Johnson.
- 152f. Photometric Laboratory. Photometric studies of incandescent and arc electric lamps, gas and oil lamps. Bench and radial photometers and illuminometers. To be taken with Course 151. One credit. Mr. Johnson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 237s. Electric Power Transmission Design. Preparation of detailed plans and specifications for the construction of high voltage transmission lines and distributing systems. Economic, electrical, and mechanical principles and calculations. Mr. Bryant, Mr. Ryan.
- 251w-253s. Illuminating Engineering. Lectures and laboratory work. Methods of determining location, kind, and quality of lights for obtaining desired illumination. Prerequisite: Course 151. Two credits per quarter. Mr. Johnson.

ELECTRIC COMMUNICATION

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 161f-162w-163s. Radio Communication. Theoretical and laboratory study of radio transmitting and receiving circuits and apparatus. Amplifiers, detectors, oscillators. Electromagnetic waves in free space and on antenna systems. Prerequisite: registration in Courses 121, 123, 125. Three credits per quarter. Mr. Webb.
- 164f-165w-166s. Electric Communication. Telephone circuits at audio and carrier frequencies. Theoretical and laboratory study of circuits having distributed constants. Use of hyperbolic functions. Wave filters, balancing net-works, equalizers, repeaters. Prerequisites: registration in Courses 121, 123, 125. Two or three credits per quarter. Mr. Hartig.
- 181s. Communication Frequency Measurements. Vector treatment of networks. Bridge circuits for measuring of resistance, inductance, and capacity at audio and carrier frequencies. Prerequisite: Course 126. Two credits. Mr. Hartig.
- 187f, 188w, 189s. Special Communication Laboratory. Special problems in electrical communication. Open by permission to qualified students. Includes weekly seminar meeting. One to twelve credits total. Mr. Hartig.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 261f-263w-265s. Advanced Radio Communication. Theoretical study of the transmission of electromagnetic waves. Design and testing of radio transmitting and receiving apparatus. Theory of electron tubes

- and their use in radio circuits. High frequency measurements. Taken with Course 262-264-266. Two credits per quarter; registration by permission. Mr. Webb.
- 262f-264w-266s. Advanced Radio Laboratory. Special problems in radio laboratory and station, usually taken in connection with Course 261-263-265. For students specializing in electrical communication. One or more credits per quarter; registration by permission. Mr. Webb.
- 267f-268w-269s. Telephone Transmission. Advanced transmission theory at communication frequencies. Class and laboratory. Two or three credits; registration by permission. Mr. Hartig.
- 281w-282s. Advanced High Frequency Measurements. Vector treatment of circuit networks. Bridge circuits for the measurement of resistance, inductance, and capacity at audio and radio frequencies. Prerequisite: Course 126. Two credits per quarter. Mr. Webb.
- 287f-288w-289s. Advanced Communication Laboratory and Seminar. Special problems in communication. Study and discussion of current articles on communication. Two or three credits; registration by permission. Mr. Hartig.

GENERAL

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- G.E.111s. Valuation of Public Utility Properties. Factors affecting value, depreciation, taxation, and regulation of public utility properties. Elements of engineering economics; cost analysis, economic investigations, rate making. Two credits. Mr. Ryan and non-resident lecturers.
- G.E.112f-113w-114s. Rates for Public Utility Properties. Determination of the rate base and depreciation amount for transportation, gas, water, electric power and telephone utilities operating expenses, the rate structure for particular utilities, service and discrimination. Open only to senior and graduate students in engineering. Three credits per quarter. Mr. Bryant.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 291f-292w-293s. Graduate Seminar. Discussions of problems and results of research work. One credit per quarter.
- 294f-295w-296s. Electrical Ignition and Automobile Electrical Accessories. The study of ignition apparatus; characteristics of automobile accessories, such as generators, starters, controllers, etc. Laboratory and lectures. Prerequisite: Course 121 or equiv. Two credits per quarter. Mr. Springer.

ENGINEERING

See Aeronautical, Civil, Electrical, Mechanical, Structural Engineering. For Chemical Engineering, see Chemistry.

ENGLISH

Professors Cecil A. Moore, Joseph W. Beach, Martin B. Ruud, Elmer E. Stoll, Joseph M. Thomas, J. Douglas Bush; Associate Professors G. Tremaine McDowell; Assistant Professors Muriel B. Carr, William P. Dunn, James T. Hillhouse, Elizabeth Jackson, Charles W. Nichols, Anna H. Phelan.

Before registering for graduate courses, students should consult with the director of graduate work for the department, Mr. Bush.

Before the acceptance of his subject for a thesis, a candidate for the degree of M.A. or Ph.D. must have given evidence to the department that he speaks and writes English with propriety.

REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

1. *Prerequisite.*—(1) For major work, not less than 27 credit hours in English literature, 12 of which must be of senior college grade, including a satisfactory course in either Chaucer or Shakespeare; for minor work, not less than 27 credit hours in English literature. (2) Unless special exception is made upon petition to the department, the candidate is required to have a reading knowledge of two of the following languages: French, German, Latin.

2. The minimum requirement of 18 credits in the major is interpreted to mean 18 credits in subjects listed below as "Courses in English." If the candidate has not previously had an elementary course in Old English, this subject must be included in his program of graduate study.

3. Before taking the oral examination, the candidate is given a written examination on the history of English literature.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

1. *Delimitation of the field.*—The general field of English is divided into two periods (1) Early English and (2) Modern English. The boundary line between these periods may be drawn anywhere between 1500 and 1550 according to the requirements of the candidate's program. A candidate may select as his major subject either the Early English or the Modern English period.

2. The candidate will be examined as to his knowledge of the whole field of English literature, but much more thoroly in that portion of the field covered by his major. Special emphasis will be laid, in the examination, on one particular period or one particular type (such as drama, lyric, or essay) with which he is presumed to be especially familiar. This particular period or type would naturally be that connected with his thesis.

3. The candidate must have completed, before examination, advanced courses in Chaucer and Shakespeare.

4. A good reading knowledge of Latin is in all cases desirable, and in some cases may be indicated by the candidate's adviser as indispensable.

COURSES IN ENGLISH

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f. Old English. Old English prose and poetry. The relation to modern English is particularly emphasized. Prerequisite: 8 credits above 50. Four credits. MTWF II; 205F. Mr. Ruud.
- 101f. Middle English. An outline of Middle English grammar, including the interpretation of selected texts. Prerequisites: Courses 75 and 100. Two credits. Mr. Ruud.
- 102w. Old English Poetry. Critical reading of poems. Three credits. Prerequisite: Course 100. MWF II; 302F. Mr. Ruud.
- 103s. Beowulf. An introduction to the Old English poem, with reading of considerable portions of the text. Prerequisite: Course 100. Three credits. MWF II; 302F. Mr. Ruud.
- 105w-106s. Eighteenth-Century Poetry. From Pope to Burns, with special reference to the rise and growth of romanticism. Prerequisite: 8 credits above 50. Six credits. MWF VII; 204F. Mr. Moore.
- 107w-108s. Eighteenth-Century Prose. Special study of fiction and the essay. Prerequisite: 8 credits above 50. Six credits. Mr. Moore.
- 109f-110w. The Romantic Poets of the Nineteenth Century. From Wordsworth to Keats. Prerequisite: 8 credits above 50. Six credits. TThS III; 204F. Mr. Beach.
- 111f-112w. Seventeenth-Century Prose. General survey of the prose of the century to 1660. Prerequisite: 8 credits above 50. Six credits. MWF III; 306F. Mr. Bush.
- 123f-124w-125s. The Technique of the Novel. Special studies in novels of the late nineteenth and twentieth centuries, with particular regard to structure. Prerequisite: 8 credits above 50 and the permission of the instructor. Nine credits. T 4:00 to 6:00 p.m.; 205F. Mr. Beach.
- 126w-127s. Drama, 1660-1880. Prerequisite: 8 credits above 50. Six credits. TThS III; 205F. Mr. Hillhouse, Mr. Nichols.
- 129s. Modern Drama. Contemporary drama from 1870 to the present. Prerequisite: English 55-56. Four credits. MTWF II; 204F. Mr. Stoll.
- 133f. The English and Scottish Popular Ballads. A study of a large number of traditional ballads, English and foreign, and of ballad style and origins. Prerequisite: 8 credits above 50. Three credits. MWF III; 203F. Mr. Ruud.
- 136s. Advanced Shakespeare. Shakespeare's development traced to the end. A careful analysis of four plays. Problems in the interpretation of Shakespeare's dramatic methods. Prerequisite: English 55-56. Four credits. MTWF I; 204F. Mr. Stoll.
- 140s. Advanced Chaucer. The more important poems (except those read in Course 75). The treatment will be primarily literary and historical, linguistic proficiency being presumed. Prerequisite: 8 credits above 50, including 75. Four credits. MTWF III; 209½F. Mr. Ruud.

- 141-142-143. Historical Grammar of the English Language. This course is identical with Comparative Philology 141-142-143. Prerequisite: 8 credits above 50, including 75 or 81-82. Six credits. Mr. Klaeber.
- 146f-147w. The Metrical Romances. The more important Middle English romances of the non-Arthurian cycles. Prerequisites: 8 credits above 50, including 75 or 81, 82. Six credits. MWF VI; 306F. Miss Carr.
- 148-149. Arthurian Romances. An introduction to the great stories of love and chivalry connected with King Arthur and the Round Table. Prerequisite: 8 credits above 50, including 75 or 81-82. Six credits. Miss Carr.
150. Victorian Poetry. The poetry of the Victorian era, aside from Browning's and Tennyson's. The principal names are: Matthew Arnold, the Rossettis, Fitzgerald, Morris, Swinburne, and Meredith. Prerequisite: 8 credits above 50. Four credits. Mr. Stoll.
- 151s. Recent Poetry. Poetry in England and America since the death of Queen Victoria. The main tradition and tendencies now prevailing. Prerequisite: 8 credits above 50. Four credits. TWThF III; 204F. Mr. Beach.
- 152f. Pre-Elizabethan Drama. The late medieval and the Renaissance drama, moralities, interludes, and farces up through the earlier years of the Elizabethan period. Prerequisite: Course 55-56. Three credits. MWF IV; 205F. Mr. Bush.
- 154w-155s. The American Novel. The history of the American novel from the beginning to the present. Prerequisite: English 73-74. Six credits. MWF VI; 205F. Mr. McDowell.
156. The American Drama. Survey of American drama in the eighteenth and nineteenth centuries. Prerequisite: 8 credits above 50, including 73-74. Three credits. Mr. Nichols.
- 157-158. Elizabeth Non-Dramatic Literature. A survey of prose and poetry, 1558-1603. Prerequisite: 8 credits above 50, including 51 or 70 or 55-56 or 170. Six credits. Mr. Bush.
- 159f. Colonial Literature in America. Covers the period from 1608 to 1783. Prerequisite: 8 credits above 50, including 73-74. Three credits. MWF VI; 205F. Mr. Nichols.
160. History of the English Language. Prerequisite: Course 100. Two credits.
- 162f. Restoration Literature. Prerequisite: 8 credits above 50. Four credits. MTWF IV; 204F. Mr. Moore.
- 164s. Dante in English. See Italian 164s. Three credits.
- 165w. The Historical Study of Modern English. Prerequisite: 8 credits above 50. Three credits. MWF III; 205F. Mr. Ruud.
- 168s. English Literary Criticism. A historical sketch, with special reference to Aristotle, Sir Philip Sidney, Dryden, Dr. Johnson, Coleridge, Arnold, T. S. Eliot. Prerequisite: 8 credits above 50. Three credits. MWF IV; 204F. Mr. Bush.
- 170w. Elizabethan Drama. Elizabethan dramatic art aside from Shakespeare's. Special attention to the art of the chief writers—Marlowe,

Jonson, Beaumont and Fletcher, Webster, and Massinger. Prerequisite: 8 credits above 50 including 55-56. Four credits. MTWF IV; 204F. Mr. Stoll.

217f-218w-219s. Restoration Drama. Nine credits. M 4:00 to 6:00; 312 Lib. Mr. Stoll.

COURSES PRIMARILY FOR GRADUATE STUDENTS

220f-221w-222s. Medieval Drama. Nine credits. W 4:00 to 6:00; 312Lib. Mr. Ruud.

225-226-227. Elizabethan Drama. Elizabethan and Jacobean dramatists, from Lyly to Shirley. Problems assigned may involve Shakespeare, and in general his contemporaries will be studied less for their own sakes than for the light they shed upon him. Nine credits. M 4:00 to 6:00; 312Lib. Mr. Stoll. (Not offered in 1931-32.)

228f-229w-230s. Eighteenth-Century Novel. The rise and development of the novel as a form of literature; the use made of the novel as a medium of religious, social, and political theory. Nine credits. Th 4:00 to 6:00; 312Lib. Mr. Moore.

231f-232w-233s. Shakespeare's Tragic and Comic Art. Nine credits. M 4:00 to 6:00; 312Lib. Mr. Stoll. (Not offered in 1931-32.)

234f-235w-236s. Middle English Alliterative Poetry. A literary and linguistic study of selected Middle English alliterative poems. Nine credits. W 4:00 to 6:00; 312Lib. Mr. Ruud. (Not offered in 1931-32.)

237f-238w-239s. Chaucer. A study of some of the important problems in the Chaucer canon and in the works of Chaucer. Nine credits. W 4:00 to 6:00; 312Lib. Mr. Ruud. (Not offered in 1931-32.)

240f-241w-242s. The *Canterbury Tales*. Nine credits. W 4:00 to 6:00; 312Lib. Mr. Ruud.

243f-244w-245s. Non-Dramatic Literature of the Sixteenth Century. The Renaissance in England; prose and poetry, with special attention to Spenser and his contemporaries. Nine credits. F 4:00 to 6:00; 312 Lib. Mr. Bush. (Not offered in 1931-32.)

246f-247w-248s. American Literature from 1783 to 1832. Nine credits. F 4:00 to 6:00; 314Lib. Mr. McDowell. (Not offered in 1931-32.)

250f-251w-252s. Classical Backgrounds of Nineteenth-Century Literature. Classical influences upon poetry from Wordsworth to the present; the prose of Landor, Arnold, and others. Nine credits. F 4:00 to 6:00; 312Lib. Mr. Bush. (Not offered in 1931-32.)

253f-254w-255s. Studies in Hawthorne, Poe, and Emerson. Nine credits. F 4:00 to 6:00; 314Lib. Mr. McDowell.

256f-257w-258s. Spenser and Milton. Reading of the poetry in full and a good deal of Milton's prose. The two poets will be studied as the great English exponents of Renaissance ideas and ideals. Nine credits. F 4:00 to 6:00; 312Lib. Mr. Bush.

259f-260w-261s. The Victorian Period of the English Novel. The Gothic Romance and the Revolutionary Novel, the realistic novel of national

manners and Jane Austen. Sir Walter Scott and the more important later romancers. T 4:00 to 6:00; 312Lib. Mr. Hillhouse.

For courses in Comparative Literature and in Composition see page 48.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

Professors William A. Riley,* Arthur G. Ruggles, Maurice C. Tanquary; Associate Professors Alexander A. Granovsky, Julian G. Leach; Assistant Professors Samuel Eddy, Clarence E. Mickel.

Prerequisites.—Eighteen credits in zoology and entomology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 117f-118w-119s. General Ecology. General ecology with special reference to the insects of Minnesota. Frequent field trips. Lectures, laboratory, and field work. TTh V-VII; 208-210Z. Mr. Eddy.
- 124su. Advanced Ecology. Similar to Course 117-118-119 with special field work.
- 125f-126w-127s. Advanced General Entomology. Morphology and classification of insects with lectures on the history of entomology. Lectures and laboratory. TThS III, IV; 208-210Z. Mr. Mickel.
- 139f-140w. Histology and Development of Insects. Lectures and laboratory work on the histology, embryonic and postembryonic development of insects. Individual work along these lines is available to properly qualified students under Course 197. TTh I, II, and ar.; 302Ad(F). Mr. Riley.
- 141f-142w. Insects in Relation to Plant Diseases. A study of the principal insect vectors and their habits; types of insect injuries affecting health of plants; modes of insect transmission and dissemination of plant diseases; the methods of rearing and handling the carriers. Of interest to students in entomology, plant pathology, horticulture, forestry, and agronomy. Prerequisites: Entomology, 8 credits and Plant Pathology, 8 credits or consent of instructors. Six credits. TThS III-IV; 302Ad(F). Mr. Granovsky, Mr. Leach.
- 144f-145w-146s. Animal Parasites and Parasitism. Lectures and laboratory work. Second term devoted primarily to the relation of insects to diseases of man and animals. WF V-VII; 208-210Z. Mr. Riley.
160. General Forest Entomology. Lectures, laboratory, and library work treating of the life history, habits, and ecological relationships of insects that affect trees and forest products.
- 175f. Insecticides and Their Action. Special studies of insecticides. Lectures and laboratory. Three credits. MWF I; Lab. ar.; 302Ad(F). Mr. Shepard.
- 176w-177s. Advanced Economic Entomology. A study of the principles of insect control and the history of economic entomology. Lectures. Three credits per quarter. MWF I; 302Ad(F). Mr. Ruggles.

* Absent on leave, 1931-32.

197f,w,s,su. Introduction to Research. Preparation for investigational work in lines of entomology, parasitology, ecology, or economic zoology. Summer work should be planned when possible. Mr. Eddy, ecology; Mr. Riley, parasitology, insect morphology; Mr. Ruggles, general economic entomology; Mr. Tanquary, apiculture; Mr. ———, economic vertebrate zoology; Mr. Mickel, systematic entomology; Mr. Shepard, insecticides.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-204. Research in Entomology. Mr. Riley, Mr. Granovsky, Mr. Mickel.
 205-208. Research in Economic Entomology. Mr. Ruggles.
 209-212. Research in Economic Vertebrate Zoology.
 261-264. Research in Parasitology and Medical Entomology. Mr. Riley.
 265-268. Research in Insecticides. Mr. Shepard.
 269-272. Research in Apiculture. Mr. Tanquary.

FARM MANAGEMENT AND AGRICULTURAL ECONOMICS

For courses and staff see Economics.

FINE ARTS

Assistant Professor Upjohn.

201f-202w-203s. A limited number of graduate students will be accepted for advanced study and reading under personal guidance. This work will be concerned with the history of art during historical periods, in various countries including the United States and with the genesis and development of art types, tendencies, and schools in architecture and the fine arts. Prerequisites: 18 quarter credits in Senior College in history of art or permission of the instructor. Three credits per quarter. Mr. Upjohn.

FORESTRY

Professors Henry Schmitz, John H. Allison, Edward G. Cheyney, Raphael Zon; Assistant Professors Randolph M. Brown, Louis W. Rees.

Prerequisites.—For major work, 27 credits in forestry, three quarters of botany or equivalent. For minor work, 9 credits in the department.

Exemptions from the language requirement for the Master's degree may be made in individual cases.

The choice in subject must be made by the candidate and approved by the chief of the division and instructor. The facilities of the forest experiment stations at Cloquet and Itasca are available to students taking this work.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101w. Advanced Dendrology. A continuation of Course 3-4 with special studies in classification and distribution of the timber species of the world. Prerequisites: 10 credits in botany and 8 credits in dendrology. Three credits. TThS I; 30rHr(F). Mr. Rees.

- 112w. Advanced Forest Mensuration. Continuation of Course 10 with special emphasis on the application of alinement charts and correlation in forest mensuration. Ar. Mr. Brown.
- 113f. Wood Pulps and Papers. A detailed study of production of wood pulp and paper products. Lectures, reading, reports. Prerequisites: Course 33-34, Chem. 3 or 10 and Chem. 36. Three credits. Ar. 302Hr(F). Mr. Allison.
- 114f-115w. Mechanical and Physical Properties of Wood. Derivation and application of the formulas used in determining stresses in wood. Laboratory methods in timber physics. Lectures, laboratory, reading, and reports. Prerequisite: Course 33-34. Six credits. TThS I, II; 7Da(F). Mr. Rees.
- 116s. Mechanical and Physical Properties of Wood. Study of the physical properties of wood. Shrinkage, relation of strength to moisture content, etc., and their bearing on wood utilization. Laboratory reading and reports. Prerequisite: Course 114-115. Three credits. MWF I, II; 7Da(F). Mr. Rees.
- 119w. Advanced Wood Structure I. The microtechnique of woody tissues. Lectures, reading, and laboratory work. Prerequisite: Course 33-34. Three credits. Ar. Mr. Rees.
- 120s. Advanced Wood Structure II. Advanced study of the anatomy of woody plants. Reading, laboratory, and reports. Prerequisite: Course 119. Three credits. Ar. Mr. Rees.
- 125s. Wood Preservation. Lectures and collateral reading upon the history, development, and methods of wood preservation. Different systems now in use and preservatives used. MWF IV; 301Hr(F). Mr. Schmitz.
- 126f. Silvics. The fundamentals forming the basis of silviculture with special attention to the silvics of the important tree species. Lectures, readings, and required papers. TThS IV; 301Hr(F). Mr. Cheyney.
- 127w. Silviculture. A study of the general principles underlying the art of silviculture, and a brief study of the European methods as applied to American conditions. TThS III; 301Hr(F). Mr. Cheyney.
- 128s. Silvicultural Laboratory. Nursery practice and field planting. Field investigations and planting plans. Seed collecting, extracting, and storing. Dairy nursery and field work. Cloquet Forest Experiment Station. Mr. Cheyney.
- 129f. American Silvicultural Practice. A study of the silvicultural methods now being employed in the United States and the probable results of the application of other European methods. Lectures, references, and discussion. Three credits. TThS III; 301Hr(F). Mr. Cheyney.
- 130f. Forest Valuation. The business of forest management. A study of the different factors entering into the valuation of forest property. MTWThF I; 301Hr(F). Mr. Allison.
- 131w. Forest Policy and Administration. The policy of the United States and the states toward the utilization of the public forest resources. Policy of other owners toward forest resources controlled by them.

- Administration of the national and state forests. MTWFS IV; 301Hr(F). Mr. Allison.
- 132s. Forest Regulation Laboratory. Field work. The collection of the data necessary to work up a forest working plan. Includes the making of the timber estimates, growth studies, and maps necessary to a forest working plan. Cloquet Forest Experiment Station. Mr. Allison.
- 136f. Forest Economics. The place of the forest in the productive utilization of land; past and present markets and source of supply of timber and timber products, particularly with reference to the present situation in North America. MWF II; 301Hr(F). Mr. Allison.
- 140f. Forest Working Plans. A study of methods of regulating and allotting the cut from a forest under management. Preparation of a working plan. Lectures and reports. Ar.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-202. Research Problems in Science and Practice of Silviculture. Mr. Cheyney.
- 203-204. Research Problems in Forest Management and Working Plans. Mr. Allison.
- 205-206. Research Problems in Forest Economics. Mr. Allison.
- 207f-208w-209s. Research in Wood Technology. Mr. Rees.
- 210f-211w-212s. Special Problems in Forest Research and Research Methods. Mr. Zon.
- 213f-214w-215s. Special Problems in Forest Utilization. Mr. Schmitz, Mr. Rees.
- 216f-217w. Forest Seminar. Mr. Zon.
- 218f-219w. Research Problems in Forest Mensuration. Mr. Brown.

GEOGRAPHY

Professor Darrell H. Davis; Assistant Professors Ralph H. Brown, Richard Hartshorne.*

Prerequisites.—For major work, Courses 1-2 or 11, 41, and 5 additional credits in geography, Economics 6-7, and Geology 1 or 8. For minor work, 10 credits in the department.

Exemptions from the language requirement for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101s. Geography of Europe. A study of the various European countries and their economic development. Prerequisite: 20 credits in social science, to include 10 credits in geography. Three credits. MWF VII; 103Bu. Mr. Dicken.
- 102w. Trade Routes and Trade Centers. A study of the major land and ocean routes, ports and interior trade centers, and the nature and sig-

* Absent on leave, 1931-32.

- nificance of the traffic. Prerequisite: Course 41. Three credits. TThS I; 103Bu. Mr. Hartshorne.
- 110s. Geography of South America. A study of the major geographic regions of South America, with emphasis upon the economic activities and their geographic basis. Prerequisite: 20 credits in social science, to include 11 or 41. Three credits. MWF VI; 103Bu. Mr. Brown.
- 111s. Cartography. The construction and use of maps and graphs. Prerequisite: 10 credits in senior college work in geography, geology, history, or other subject in which the use of maps is necessary. Three credits. MWF III; 105Bu. Mr. Hartshorne. (Not offered in 1931-32.)
- 120w. Geography of Asia. Areal differentiation in the major geographic regions of Asia. Special consideration of China, Japan, and India. Prerequisite: 20 credits in social science, to include 11 or 41. Three credits. MWF III; 105Bu. Mr. Davis.
- 133w. Climatology. Weather and climate in their relation to man and his activities. Prerequisite: Course 11. Three credits. MWF I; 103Bu. Mr. Brown.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 235s. Geography of Minnesota. A regional economic study of the state. The basis for existing industry and city development will receive special consideration. Prerequisite: 12 credits in geography, or 20 credits in social science to include at least 9 credits in geography. Permission of instructor necessary. Three credits. MWF I; 105Bu. Mr. Davis.
- 241f,s. Field Course in Geography. A consideration of the problems of field work, illustrated by field trips. Prerequisite: 18 credits in geography. Three credits. Hrs. ar. Mr. Davis.
- 251f-252w-253s. Seminar in Geography. A survey of current literature with reports and discussion on assigned topics. Prerequisite: 20 credits in geography or permission of instructor. Three credits. Th VII; 105Bu. Mr. Davis and staff.
- 301f,w,s. Research Problems in Geography. Credits and hours arranged. Mr. Davis, Mr. Hartshorne, Mr. Brown.

GEOLOGY AND MINERALOGY

Professors William H. Emmons, Frank F. Grout, Clinton R. Stauffer; Associate Professors John W. Gruner, George M. Schwartz, George A. Thiel.

Prerequisites.—For major work in geology: Elementary courses in geology, such as Courses 1 and 2, or their equivalent; Mineralogy 23 and 24; General Chemistry, such as Courses 1, 2 and 3, or equivalent. In addition, for those specializing in mineralogy, petrography, and economic geology, elementary physics, such as Courses 3 and 4, or equivalent, is required; and for those specializing in paleontology or stratigraphy, Index Fossils (Course 91-92-93) and Elementary Zoology, such as Courses 1 and 2, or their equivalent, are required. Students who have not had the

necessary prerequisites may take them without credit along with other work for which they are prepared.

Whatever field of special interest is pursued, it is expected that the student registering for the doctorate in this department will take some courses in each of the major divisions of geology, if he has not already had them, and those conducting the preliminary examination will assume that this has been done.

A student selecting some branch of geology as a major will not be allowed to select general geology as a minor. It is always preferable that the minor be taken outside of the major department.

Exemptions from the language requirements for the Master's degree may be made in individual cases. Students who are deficient in modern languages are advised to take a language along with their graduate work. Examinations in French or German are required of candidates for service on the United States Geological Survey.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. Sedimentation. The origin of sedimentary rocks and their primary structures; interpretation of sediments in relation to paleogeography. Lectures and assigned readings. Three credits. MWF IV. Mr. Thiel.
- 102w-103s. Micropaleontology. The study and classification of Foraminifera, diatoms, and other small fossil organisms and their use for purposes of correlation in oil fields. Three credit hours of laboratory work. Hours arranged. Winter and spring quarters. Open to students who have had Geology 11 or 91, and 105. Mr. Stauffer.
- 105f. Elements of Rock Study. Prerequisite: Course 25. Three credits. TTh VI, VII; 110P. Mr. Grout.
- 106w. Petrography. The identification and study of minerals and rocks by optical methods; the study of igneous rocks, crystalline schists, and metamorphic rocks. The origin and classification of rocks. Prerequisite: Course 105. Three credits. MF VII, VIII; 110P. Mr. Grout.
- 107f-108w-109s. Paleontologic Practice. The collection, preparation, and study of materials, with a view to gaining a working knowledge of groups of fossils, and the use of literature. Prerequisite: Course 91-92-93. Nine credits. MWF V, VII; 105P. Mr. Stauffer.
- 111f. Ore Deposits. The nature, distribution, and genesis of ore deposits of the United States; relations of ore deposits to geologic structure; the deformation and superficial alteration of ore deposits. Prerequisites: Courses 10, 105. Three credits. TThS I; 110P. Mr. Emmons.
- 112w. Geology of Petroleum. The first part treats of deposits of metals, giving special attention to those outside of the United States. The second half deals with the nature, origin, and distribution of petroleum and with the various oil fields of the world. Prerequisite: Course 111. Three credits. TThS I; 110P. Mr. Emmons.
- 113s. Problems in Ore Deposits. Field excursions, map work, lectures on field and laboratory methods. Prerequisite: Course 112. Three credits. Th VI-IX; 110P. Mr. Emmons.

- 121f. Crystallography. The symmetry relations in the thirty-two crystal classes. Crystal drawings and measurements. Projections and mathematical calculations. Prerequisites: Mathematics 7 and elementary inorganic chemistry. Three credits. Hrs. ar.; 100P. Mr. Gruner.
- 124w-125s. Structural and Metamorphic Geology. The conditions, processes, and results of metamorphism; structural features resulting from deformation under varying conditions of load. Prerequisites: Courses 9 or 10, 105. Six credits. MWF VI; 208P. Mr. Schwartz.
- 127f. Geology of the Lake Superior Region. Structure and correlation of districts. Interpretation of field notes and survey reports. Practical problems. The use of geologic bibliographies and literature. Prerequisite: Course 124-125. Three credits. Hrs. ar. Mr. Thiel.
- 131f-132w-133s. Advanced Petrology. Advanced optical methods. Regional and genetic studies. Petrographic reports. Prerequisite: Course 106. Nine credits. TThS II-III; 200P. Mr. Grout.
- 137f. Testing Economic Minerals. Laboratory tests of coal, clay, oil, building stone, and metallic ores. Prerequisites: Courses 1, 105. Three credits. MT VI-VIII; 200P. Mr. Gruner.
- 140w-141s. Applied Petrography. Determination of ore and gangue minerals, microscopic studies of paragenesis of ores and other mineral associations. Practical problems in mining and geology, settled by microscopic and optical examination. Prerequisite: Course 131. Six credits. MW I, MWF II; 200P. Mr. Grout, Mr. Gruner.
- 144w-145s. Construction and Interpretation of Geologic Maps. Methods of geological examination; study and problems in construction and interpretation of geologic maps. Prerequisite: Course 9 or 10. Six credits. TTh VII-IX.
- 149s. Methods of Field Geology. General methods of field work necessary for Course 150. Mr. Schwartz.
- 150s. Field Geology. Detailed, systematic work, conforming to official surveys. Reports to be written week before college opens. For prerequisites see members of the department. Credits arranged. Mr. Enmons, Mr. Schwartz.
- 151f-152w-153s. Advanced General Geology. Geologic processes and their results; development of the North American continent. Prerequisite: Course 9. Nine credits. MWF III; 210P. Mr. Stauffer.
- 161w. Crystal Structure. Study of point groups and space groups. Diffraction of X-rays by crystals. Interpretation of powder and Laue diagrams. Prerequisites: Course 121, elementary physics, and analytical geometry. Three credits. Hrs. ar.; 100P. Mr. Gruner.
- 166f-167w. Mineralography. Methods of studying opaque minerals and application of the methods to problems in ore genesis and history. Prerequisite: Course 111. Six credits. Hrs. ar.; 207P. Mr. Schwartz.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 211f-212w-213s. Advanced Paleontology. Selected groups of fossils. Class work supplemented by reference reading and thesis. Nine credits. Mr. Stauffer.

214. Seminar in Ore Deposits. Three credits. Mr. Emmons.
- 215s. Geology and Ore Deposits of the Western Hemisphere. Open to graduate students and to those undergraduates who have had Course 111. Three credits. Mr. Emmons.
- 216s. Geology and Ore Deposits of the Eastern Hemisphere. Prerequisites same as for Course 215. Three credits. Mr. Emmons.
220. Glacial Geology. The drift sheets, glacial lakes, the gorge of St. Anthony Falls, the dalles of the St. Croix, and other problems. Lectures, reference reading, and field work. Hrs. ar.
241. Field Course in Geology. To be arranged with individual students upon application to the department. Credit will be given for field work done satisfactorily as prescribed in the joint announcement of various universities.
- 243-244. Research Course in Geology. Advanced work in general geology; chiefly individual work on selected subjects. Data and collections of material gathered in the course of field work studied under instructor. Methods follow standards of federal and state surveys. Mr. Emmons, Mr. Grout, Mr. Stauffer.
246. Pre-Cambrian Geology. The problems of pre-Cambrian correlation and structure; the pre-Cambrian stratigraphy of North America. Given in alternate years. Three credits.
- 251-252. Original Problems. Morphology and physical measurements of minerals. Three credits each. Mr. Gruner.
- 253-254. Research Course in Ore Deposits. Methods of Course 243-244 applied to ore deposits. Three credits each. Mr. Emmons, Mr. Grout, Mr. Gruner, Mr. Schwartz.
- 263-264. Research Course in Petrology. Methods of Course 243-244 applied to petrology. Three credits each. Mr. Emmons, Mr. Grout.

GERMAN

Professors Samuel Kroesch, Oscar C. Burkhard; Associate Professor George Lussky; Assistant Professors James Davies, Frederick L. Pfeiffer.

Prerequisites.—For major work, 27 senior college quarter credits or equivalent. For minor work, 18 senior college credits or equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 107su. Historical German Grammar. Phonology, inflection, word formation, syntax. Intended primarily for prospective teachers of German. Three credits. Mr. Kroesch.
- 108s. Comparative Phonetics. A study of speech sounds and the nature of their production, with special reference to English, French, and German. Open to students in the modern languages. Three credits. MWF III; 207F. Mr. Kroesch.
- 115-116-117. Middle High German Literature. Heldenepos, Höfisches Epos, Minnesang. Nine credits. Th VI, VII, VIII. Mr. Kroesch.

- 120-121-122. Proseminar: History of German Literature. This course provides the necessary background for graduate work in German literature, and serves as an introduction to bibliography, methodology, and literary criticism. Required of all graduate majors in German. (Offered in 1932-33.)
- 120f. German Literature through the Reformation Period. Mr. Kroesch.
- 121w. The Seventeenth and Eighteenth Centuries. Mr. Burkhard.
- 122s. The Nineteenth Century. Mr. Pfeiffer.
- 143f-144w-145s. The Classical Period. From Gottsched through Goethe. Nine credits. W VI, VII, VIII. Mr. Lussky.
- 150f-151w-152s. Die Novelle. A study of the technique and development. Assigned readings and reports. Nine credits. Mr. Burkhard.
- 160f-161w-162s. Lyric Poetry of the Eighteenth and Nineteenth Centuries. Nine credits. M VI, VII, VIII; 209F. Mr. Davies.
- 163f-164w-165s. German and English Literary Relations in the Sixteenth, Seventeenth, and Eighteenth Centuries. Nine credits. M VI, VII, VIII; 211F. Mr. Davies. (Offered in 1932-33.)
- 173f-174w-175s. Modern Novel 1890-1930: Thomas Mann, Heinrich Mann, Ricarda Huch. F VI, VII, VIII. Mr. Pfeiffer.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 202f-203w. Gothic. The course is designed as an introduction to Germanic linguistics and to a comparative study of the Indo-European languages. Six credits. Mr. Kroesch.
- 204s. Old Saxon. The Heliand. Three credits. Mr. Kroesch.
- 209f-210w-211s. Old High German. Alternates with Course 215-216-217. The older High German dialects serve as a basis for a study of historical German grammar. Nine credits. Mr. Kroesch. (Offered in 1932-33.)
- 215f-216w-217s. Middle High German. Phonology, morphology, and syntax. Nine credits. MWF VIII; 207F. Mr. Kroesch.
- 218f-219w-220s. Seminar. Prerequisite: A good knowledge of at least two Germanic dialects. Comparative grammar of the Indo-European languages with special reference to the principal German dialects. Investigations in the comparative phonology, syntax, and semantics of these dialects. Six or nine credits. Mr. Kroesch.
- 253f-254w-255s. Nineteenth Century Drama: Kleist, Grillparzer, Hebbel. Nine credits. T VI, VII, VIII; Ar. Mr. Burkhard. (Offered in 1932-33.)

GREEK

Professor Charles Albert Savage.

Prerequisites.—For major work, Courses 105, 106 or 107, 108, or their equivalent. For minor work, Courses 51 (Philosophy), 52 (Oratory), 53 (Dramatic Poetry), or their equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 105f. Lyric Poetry. Selections from the elegiac, iambic, lyric, and bucolic poets. Three times a week. Prerequisites: Courses 51 and 53 or 52 and 53. Three credits. Ar.; 112F. Mr. Savage.
- 106w. Advanced Drama. Aeschylus, Sophocles, or Aristophanes. Special attention given to the development of the drama, and to the literary form and dramatic representation of the plays read. Three times a week. Prerequisite: Course 53 or 105 or equivalent. Three credits Ar.; 112F. Mr. Savage.
- 107w. Advanced Prose. Selections from Plutarch or Lucian. Alternates with Course 106. Equivalent prerequisites. Ar.; 112F. Mr. Savage.
- 108s. Advanced Epic Poetry. A course of rapid reading in the *Iliad* or the *Odyssey*. Three times a week. Prerequisite: Course 105 or 106. Three credits. Ar.; 112F. Mr. Savage.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-202-203. Oratory (advanced). A study of the development of oratorical style among the Greeks; selected readings. Twice weekly, one, two, or three quarters. Mr. Savage.
- 204-205-206. Dramatic Poetry (advanced). The reading and critical study of representative Greek plays. Twice weekly, one, two, or three quarters. Alternates with 201-202-203. Mr. Savage.
- 207-208-209. Seminar in Philosophy or Oratory. Once a week, one, two, or three quarters. Mr. Savage.
- 210-211-212. History (advanced). Selected readings from Greek historians. Once a week, one, two, or three quarters. Alternates with 207-208-209. Mr. Savage.

HISTORY

Professors Guy Stanton Ford, Alfred L. Burt, Herbert Heaton,* August Charles Krey, Lester Burrell Shippee, Albert Beebe White; Associate Professors Theodore C. Blegen, George M. Stephenson; Assistant Professors Harold Deutsch, Ernest Osgood, Lawrence D. Steefel, Faith Thompson, Alice F. Tyler, David H. Willson.

Prerequisites.—Of the four fields in which general survey courses in history are usually given, namely, ancient, American, English, and European, students entering upon graduate work in history will usually be expected to have covered two or three courses, with credit not exceeding 18 hours. For the other 9 hours, they should have a more advanced course in one of these fields and a second course in some field of history in which intensive work is done with the beginnings of investigation. In meeting these requirements consideration will be given to work done from the historical point of view in others of the social sciences, especially political science. The department attaches considerable importance to adequate preparation in the foreign languages, which may be used by the

* Absent on leave, 1931-32.

student in the course of advanced and research work. An especially good equipment here will be taken into consideration in weighing the student's preparation for graduate work.

REQUIREMENTS FOR THE PH.D. IN HISTORY

Candidates will be expected to fulfill the general requirements as given in this bulletin, pp. 16-20.

Preliminary Examination

For a major in history, the candidate shall choose five fields from those listed below. At least one period or field shall be chosen from groups A or B and at least one from groups C or D. Three of these fields, including that containing the subject of the proposed thesis must be related. The selection of these fields must be made in consultation with and subject to the approval of the chairman of the candidate's examination committee. These selections shall be reported by the adviser to the chairman of the History Department. In exceptional cases, the department may approve fields not included in the list.

The preliminary examination will cover the minor and four of the periods or fields chosen for the major. That field in which the candidate intends to do special work shall be reserved for the final examination. The scope of this reserved field shall be indicated to the department and approved by it at the time when the candidate is certified for the preliminary examination. Only in exceptional cases shall it cover less than one of the five fields selected from the following list:

Group A

1. The Old Orient
2. Greece
3. Rome

Group B

1. Europe, 395-1300
2. England to 1485
3. Renaissance and Reformation
4. Economic History, 1300-1600

Group C

1. England since 1485
2. Europe, 1559-1789
3. Europe, 1789 to Present
4. Economic History, 1600 to Present

Group D

1. The United States to 1789
2. The United States, 1789-1865
3. The United States since 1865
4. Economic History of the U. S., 1790-1860
5. Economic History of the U. S. since 1860

Group E

1. Asia since 476
2. European Colonies and Dependencies
3. Latin America

Final Examination

In this examination, taken after the successful completion of the preliminary examination and the acceptance of the candidate's thesis, the emphasis shall be placed upon testing the highly detailed knowledge of the student in his special subject. It shall cover that subject reserved in the

preliminary examination, and under the rules of the Graduate School, is given by the same committee that sat in the preliminary examination. This examination includes the usual defense of the thesis, its methods, results and contribution to the field investigated.

GENERAL REQUIREMENT

201f-202w-203s. Historical Bibliography and Criticism. Required of candidates for advanced degrees in history who do not present evidence of similar training elsewhere. S I; 339Lib. Mr. Ford, Mr. White, and others.

Courses numbered 150 to 200 are open to seniors and graduates; prerequisites are the appropriate survey courses (see courses numbered 50 to 100 in bulletin of the College of Science, Literature, and the Arts). Graduate students who do not present the appropriate survey courses or their equivalent are required to carry such courses without credit; in cases where such procedure is feasible the student may register for the course numbered above 149 and also attend the meetings of the appropriate survey course, being therein held responsible for class exercises and examinations if the instructor and major adviser consider it advisable.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

150f-151w-152s.† Topics in Ancient European History. Mr. Deutsch.

153f-154w-155s.† Topics in Medieval European History. One or more of the following topics will be studied in small groups: Break-up of Roman Empire; the Crusades; Empire and Papacy; Rise of Feudalism; Feudal Institutions; European Migrations; Rise of National States; Intellectual Development; the Renaissance; the Reformation; Rise of Towns, etc. Nine credits. Ar. Mr. Krey.

156f-157w-158s.† Topics in Modern European History. One or more of such topics as the following will be studied in small groups: Age of Louis XIV; the Eighteenth Century; French Revolution and Empire; Restoration and Revolution; Second French Empire; Making of Italy and Germany; International Relations, 1871-1914; Europe since 1914; the Eastern Question; Modern Russia, etc. Nine credits. Ar. Mr. Deutsch, Mr. Steefel.

170f-171w-172s.† Topics in English History. One or more of such topics as the following will be studied in small groups: Beginnings of Parliament; Legal History (Anglo-Saxon Law, the Age of Glanvill, of Bracton, of Edward II, etc.); Local Self-Government in Medieval England; Parliament and Administration in the Fourteenth Century; Antiquarianism and Political Theorists; the Tudors and Stuarts; England in the Nineteenth Century; British India; etc. Nine credits. Ar. Mr. White, Miss Thompson, Mr. Willson.

176f-177w-178f.† Topics in Canadian History. Mr. Burt.

180f-181w-182s.† Topics in Economic History. Mr. Heaton.

190f-191w-192s.† Topics in American History. Such topics as the Colonies, the Revolution and Making of the Constitution, Political Parties, Civil

War and Reconstruction; Immigration; the West; History of Minnesota; American Agriculture and Rural Life, American Diplomacy, Recent American Development; etc. Nine credits. Ar. Mr. Buck, Mr. Shippee, Mr. Blegen, Mr. Stephenson, Mr. Osgood, Mrs. Tyler.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 204f-205w-206s. Seminar in Medieval History. Nine credits. Ar. Mr. Heaton, Mr. Krey, Mr. White.
- 208f-209w-210s.† Seminar in American History. Required of graduate students whose major field is American history. The first term will be principally occupied with bibliography and technical topics. Selected fields in American history will be studied in other terms. Nine credits. S III, IV; 301Lib. Mr. Shippee, Mr. Blegen, Mr. Stephenson.
- 221f-222w-223s.† Seminar in Economic History. Nine credits. Mr. Heaton.
- 224f-225w-226s.† Seminar in Modern European History. Nine credits. Th VIII, IX; 315Lib. Mr. Deutsch, Mr. Steefel.

HOME ECONOMICS

Professor Wylle B. McNeal; Associate Professors Alice Biester, Clara M. Brown, Alice M. Child, Harriet Goldstein, Jane Leichsenring, Marion Weller; Assistant Professor Ethel Phelps.

Prerequisites.—Students desiring to major in Home Economics must present undergraduate subject-matter credits in certain of the following: social sciences, physical sciences, biological sciences, art and education—which shall be satisfactory to the adviser under whose direction the major work is to be done. In addition the student must have adequate undergraduate training in that field of Home Economics in which she wishes to specialize.

Students majoring in Home Economics for a Master's or a Doctor's degree and those minoring in this division for the Doctor's degree must include either Course 209, 279, 289, or 299 in the study program.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 102f,s. Advanced Textiles. An intensive study of textile materials with special reference to the following: nature of the raw materials; economic, chemical, and physical applications involved in their manufacture and use; methods and significance of physical testing. Prerequisites: Textiles 5 cred., Org. Chem. 5 or 6 cred., Principles of Economics 5 cred., or parallel. Three credits. TTh VI, VII, VIII; 307-311HE. Miss Phelps.
- 107w. Textile Analysis. Problems and application of quantitative methods in textile analysis with special reference to establishing standards for fabrics. Prerequisites: Course 102, Agr. Biochem. 2. Three credits. MWF VI, VII, VIII; 311HE. Miss Phelps.

- 115f,w. Clothing Economics. A study of the economic aspects of clothing which directly or indirectly affect the consumer. Prerequisites: Course 13, Agr. Econ. I. Two credits. TTh III; 203HE. Miss Weller.
- 131f,w,s. Home Management: House Planning and Equipment. Study of the small house which aims at more intelligent planning in building and furnishing. House plans, kitchen arrangements, and equipment of house studied from homemaker's point of view of economy, convenience, and beauty. Prerequisite: Course 53. Five credits. Fall, MTWFS III, IV; winter, MTWThF VI, VII; spring, Sec. 1, MTWFS III, IV; Sec. 2, MTWThF VI, VII; 401HE. Miss H. Goldstein, Miss V. Goldstein.
- 136s. Problems of Income Management. An intensive study of problems relating to individual and family budgets. Readings, discussions, and field work. Prerequisites: Courses 34, 35, 170, Agr. Econ. 126 or parallel. Three credits. MWF II. Miss Studley.
- 150f,w,s. Art History and Appreciation. The historical development of painting, sculpture, architecture, decoration, furniture, and costumes, studied with special emphasis on design and influence upon modern styles. Prerequisite: Course 51 or equivalent. Three credits. MWF VIII; 313HE. Miss H. Goldstein, Miss V. Goldstein.
- 152w. Advanced Interior Design. Special problems of small house decoration, involving execution of elevation drawings. Studies and reports on topics of historical and practical interest. Actual materials used as far as possible. Prerequisites: Courses 53, 131, or parallel, 150. Three credits. MWF I, II; 401HE. Miss V. Goldstein.
- 154s. Advanced Costume Design. Study of figure construction. Relation of color and texture to dress design. Studies and reports on assigned topics. Laboratory work with fabrics. Designs in pencil and water colors. Prerequisites: Courses 13, 53, 55 recommended. Three credits. TThS I, II; 401HE. Miss H. Goldstein.
- 163s. Institution Management Problems. Problems affecting the efficient administration of the institution; departmental organization, operation, maintenance; employment problems; business policies. Field trips to various types of institutions. Prerequisites: Courses 61, 63. Three credits. Lect., TTh III; 106HE.; lab., S III, IV; DiH. Miss Dunning.
- 170f,w,s. Nutrition of the Family. The fundamental principles of human nutrition as applied to the feeding of individuals and groups under conditions of health. Prerequisites: Courses 80 or 81, Agr. Biochem. 4, Physiol. 4. Three credits. Fall and spring, Sec. 1, MWF I; Sec. 2, MWF IV; winter, MWF I; 203HE. Miss Biester, Miss Hunt.
- 171f,w,s. Child Nutrition. Lectures, discussions, and field work dealing with the principles of child nutrition and with the formation of desired food habits. Prerequisites: Course 170, H.E.Ed. 40. Three credits. Lect., MW III, F III, IV; lab., IV, day to be arranged before completing registration; 213HE. Miss Leichsenring.
- 173s. Nutrition in Disease. A study of the fundamental principles involved in using diet in the treatment of certain diseases. Prerequisites: Courses 170, 175. Three credits. Lect., MWF VII; 213HE. Miss Hunt.

- 175f,w. Nutrition II. Metabolism, including work on tissues, blood, milk, and urine. Prerequisite: Course 73. Four credits. Fall, MTWTh I, II; winter, MWF VI, VII, VIII; 211,213HE. Miss Biester, Miss Hunt.
- 176w. Advanced Nutrition. Selected quantitative methods applicable to investigations relating to digestion and metabolism. Prerequisites: Course 73, Agr. Biochem 2. Four credits. Lect., T I; lab., Th I, II, III; TS II, III, IV; 311,313HE. Miss Biester.
- 177w,s. Digestion and Metabolism. An intensive study of problems relating to digestion and metabolism involving lectures, reading, demonstrations, and laboratory work. Prerequisites: Course 175, Agr. Biochem. 2. Three credits. TTh VI, VII, VIII; 213HE. Miss Leichsenring.
- 178f,w,s. Clinical Problems in Nutrition. The application of nutrition information to problems in health and disease involving assigned readings, discussions and experience in a clinic or with case work. Two credits. Prerequisite: 71 or parallel, 170 or parallel, 175. Limited to 8. Lect. T VI; lab. Th VI, VII, VIII. Miss Hunt.
- 179w,s. Readings in Nutrition. A course designed to give intensive experience in the use of nutrition books and periodicals, involving assigned readings, oral and written reports. Prerequisite: Course 170. Two credits. Winter, MW IV; spring, TTh I; 213HE. Miss Biester, Miss Leichsenring.
- 182f,w,s. Experimental Cookery. An intensive study of problems in foods and food preparation with individual laboratory problems. Prerequisite: Course 80. Three credits. Fall, winter, TTh I, II, III, MW VI, VII, VIII; spring, TTh I, II, III; 107HE. Miss Child.
- 183f,w,s. Experimental Cookery. An intensive study of problems in foods and food preparation with individual laboratory problems. Prerequisite: Course 80. Five credits. Fall, winter, TTh I, II, III, MW VI, VII, VIII; spring, TTh I, II, III and 4 hrs. ar.
- 186w,s. Special Food Problems. Individual problems in foods and food preparation. Prerequisite: Course 182. Three credits. Spring, TTh VI, VII, VIII; 107HE. Miss Child.
- 187w,s. Special Food Problems. The same as Course 186 with additional problems. Prerequisites: Course 182, Agr. Biochem. 2. Five credits. TTh VI, VII, VIII, and 4 hrs. ar.; 107HE. Miss Child.
- 195s. Home Economics Survey. A discussion of the historical development of home economics with special emphasis upon current problems. Two credits. TS IV; 203HE. Miss McNeal.

COURSES PRIMARILY FOR GRADUATE STUDENTS

202. Animal Fibers. An advanced course dealing with the structure, composition, chemical and physical properties, and special problems of manufacture of wool and silk in relation to their use. Prerequisites: Quant. Chem. 5 cred., Org. Chem. 5 or 6 cred., Adv. Textiles 3 cred. Two credits. Hrs. and days. ar. Miss Phelps.

204. Plant and Manufactured Fibers. Study of the structure, composition, physical and chemical properties, and special problems of manufacture of cotton, flax, artificial silk and certain minor fibers in relation to their use. Prerequisites: Bot. 5 cred., Quant. Chem. 5 cred., Org. Chem. 5 or 6 cred., Adv. Textiles 3 cred. Two credits. Hrs. and days ar. Miss Phelps.
- 209f,w,s. Seminar in Textiles and Clothing. Reviews and interpretations of the literature of this field, emphasizing recent advances and involving individual assignments and oral or written reports. Registration with permission of the instructor. One credit. Hrs. and days ar. Miss Phelps.
210. Microanalysis of Textile Fibers. Laboratory applications of histological and microchemical methods in the study of textile materials. Prerequisites: Bot. 5 cred., Biol. Sci. 10 cred., Org. Chem. 5 or 6 cred., Textile Analysis 3 cred. Two or three credits. Hrs. and days ar. Miss Phelps.
- 270f-271w. Principles of Human Nutrition. An advanced course dealing with certain aspects of digestion, metabolism, excretion, and food requirements under various conditions. Prerequisites: Courses 170, 175. Three credits each quarter. Hrs. and days. ar. Miss Biester, Miss Leichsenring.
- 279f,w,s. Seminar in Nutrition. Reviews and interpretations of the literature of this field, emphasizing recent advances and involving individual assignments and oral or written reports. Registration with permission of the instructor. One credit. Hrs. and days ar. Miss Biester, Miss Leichsenring.
- 289f,s. Seminar in Foods. Reviews and interpretations of the literature in the field of foods and experimental food preparation involving individual assignments and oral or written reports. Registration with permission of the instructor. One credit. Hrs. and days ar. Miss Child.
- 295f,w,296s. Home Economics Problems. Opportunity is offered for the investigation of selected problems in home economics in fields such as foods, nutrition, textiles, home management and related art. One to five credits. Hrs. and days ar. Miss Biester, Miss Brown, Miss Child, Miss H. Goldstein, Miss Leichenring, Miss Phelps, Miss Studley.
- 299f,w,s. Home Economics Seminar. A critical study of recent advances in home economics, involving outside reading and oral or written reports. One credit. Hrs. and days ar. Miss McNeal, Miss H. Goldstein, Miss Studley.

HOME ECONOMICS EDUCATION

Professor Wylle B. McNeal, Associate Professor Clara M. Brown.

Prerequisites.—For a minor adequate preparation in psychology, educational psychology, education, and home economics must be presented.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 141f. Vocational Education in Home Economics. The place and development of home economics in the vocational education program. Study of the problems of the all day, evening, and part time schools. Prerequisite: Course 42. Two credits. Hrs. and days ar. Miss McNeal, Miss Brown, Miss Rose.
- 142af,w. Educational Measurement in Home Economics. Problems of measurement in home economics; home economics tests and scales; construction and evaluation of objective tests. Prerequisite: Course 42. Two credits. Hrs. and days ar. Miss Brown.
- 142bw. Educational Measurement in Home Economics. A continuation of Course 142a, dealing with methods of interpretation and utilization of test data. Prerequisites: Course 142a, Ed.Psy. 60. Two credits. Hrs. and days ar. Miss Brown.
- 143s. Home Economics Curricula. The objectives of home economics in junior and senior high schools; recent surveys and other investigations used in determining curriculum content; home economics courses of study. Prerequisite: Course 42 or parallel. Two credits. TTh VIII; 213HE. Miss Brown, Miss Rose.
- 147w. Organization and Methods for Related Art Teaching. Organization of a related art course and methods of teaching art principles as applied to familiar objects and processes. Prerequisites: Courses 53, 131 or parallel. Three credits. TThS III; 402HE. Miss H. Goldstein.
- 149f,w,s. Research Problems. A study of the methods used in collection, treatment, and interpretation of data in the field of home economics. Credits arranged. Hrs. and days ar. Permission of instructor. Miss Brown.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 242f,w,s. Problems in Home Economics Education. Current problems in home economics education will be studied. Required of all candidates minoring in home economics education. One credit. Graduates only. Hrs. and days ar. Miss McNeal, Miss Brown, Miss Rose.
- 243f,w,s. Administration and Supervision of Home Economics. A study of the duties and problems of teacher trainers, city and state supervisors of home economics. Prerequisites: Courses 42, 49, 143 or equivalent. Three credits. Graduates only. Hrs. and days ar. Miss McNeal, Miss Rose.
- 245f,w,s. Seminar in Home Economics Education. A research course for graduate students. Required of all students writing theses in Home Economics Education. Does not carry credit as course work.

HORTICULTURE

Professor William H. Alderman; Associate Professors Wilfrid G. Brierley, Rodney B. Harvey; Assistant Professors Troy M. Currence, Fred A. Krantz, Lewis E. Longley, Arthur N. Wilcox.

Prerequisites.—For major work, 15 credits; for minor work, 9 quarter credits in department in addition to 2 years in botany and 1 in entomology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 107f. Orchard Management. A detailed study of the various operations in orchards and berry fields. Operating costs and profits. Lectures, laboratory, and individual problems. *Prerequisites:* Course 6 and Bot. 9 credits. Three credits. TS IV, W. VI, VII; 210Hr. Mr. Brierley.
- 110w. Horticultural Crop Breeding. Applied genetics is emphasized. Methods of breeding each of the important horticultural crops with special attention to experiment station investigations and to the methods used by plant breeders. *Prerequisite:* Agron. 131. Three credits. TThS III; 215Hr. Mr. Wilcox.
- 111f. Systematic Pomology. A study of fruit varieties. Lectures, laboratory, and a survey of the literature. *Prerequisites:* Course 6 and Bot. 9 credits. TTh VI, VII, VIII; 8Hr. Mr. Brierley.
- 121w. Small Fruit Culture. Cultural practices for each of the small fruits; botanic relationship; history of commercial development. Lectures, problems, and survey of literature. *Prerequisites:* Course 6 or 32. Three credits. MWF I; 102Hr. Mr. Brierley.
- 135f. Truck Crops and Potatoes I. Truck crop production as an applied science. The crop or the plant is used as the unit of consideration and the sciences used to explain cultural practices and plant behavior. *Prerequisites:* Course 32 and Bot. 9 credits. Three credits. Mr. Currence.
- 137w. Truck Crops and Potatoes II. Continuation of Course 135f. *Prerequisites:* Course 32 and Bot. 9 credits. Three credits. Mr. Krantz.
- 190f-191w-192s. Special Problems. A study of problems based upon the work given in the preceding courses. Two to four credits per quarter. Horticultural staff.
- 193f-194w-195s. Horticultural Seminar. Reports and discussions of problems and investigational work. Required of graduate students. One credit per quarter. Horticultural staff.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 242w. Horticultural Crop Breeding Topics. A survey of the recent researches in the breeding of horticultural crops. Two credits. Mr. Krantz, Mr. Wilcox.
- 243f-244w. Advanced Topics in Horticulture. A critical analysis of recent research on horticultural crops. Three credits per quarter. Mr. Alderman, Mr. Brierley, Mr. Harvey, Mr. Currence, Mr. Longley.
- 245f-246w. Growth Factors in Crop Production. An analysis of growth and environmental factors as applied to crop plants. Two credits per quarter. Mr. Harvey.

JOURNALISM

Professor Ralph D. Casey.

Prerequisites.—A total of 27 quarter credits in Journalism and English, distributed as follows:

In Journalism, a minimum of 15 credits including reporting, copy reading, and newspaper make-up, and special feature articles. In English, additional credits to make up the 27 credits, including a sophomore English composition course. Freshman composition will not satisfy the requirement. A reading knowledge of at least one foreign language.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

Fees.—A typewriter fee of \$1 is charged each quarter to all students registered for one or more Journalism courses other than Journalism 5.

- 101w. Reporting of Public Affairs. A review of city, county, state, and national government as a background for reporting. Advanced practice in the writing of news stories. Prerequisites: Course 52 and 10 credits in political science. Three credits. TThS II; 14P. Mr. Ford.
- 103s. Literary Aspects of Journalism. A study of the best journalistic work of such writers as Kipling, Sir Philip Gibbs, Richard Harding Davis, Ambrose Bierce, William Allen White, Will Irwin, Ben Hecht, Don Marquis, etc. Lectures, outside reading, and some practice in writing. Prerequisite: English 21-22. Three credits. MWF III; 10P. Mr. Ford.
- 110s. History of Journalism. A study of the evolution of the newspaper in England and the United States with special reference to the problems of present day journalism. Prerequisite: Course 15. Three credits. MWF II; 14P. Mr. Casey.
- 111f. Foreign News Sources. An examination of foreign news and the methods by which it is obtained and prepared for American readers. The importance of foreign news, the methods of correspondents in various countries, the newspapers in those countries, and some of the factors affecting the news from those countries considered. This is not a course for training foreign correspondents but is intended to help the reader understand the background of foreign news. Prerequisite: Course 41 or 51 or at least one history or political science course in international relations, or permission of instructor. MWF III; 14P. Mr. Desmond.
- 112w. Current Newspaper Problems. A study of contemporary matters of importance in journalistic fields, such as the growth of the chain newspapers, the radio in its relation to the newspaper, the professionalization of journalism, changing news values, and ethics of journalism. Prerequisite: Course 110 or 111. Three credits. MWF III; 10P. Mr. Desmond.
- 130f-131w-132s. The Press and Public Opinion. Research dealing with the various ways in which newspapers and magazines attempt to influence public opinion. A study of the technique and effectiveness of these methods. Prerequisite: 20 credits in sociology, psychology, or political science. Nine credits. MWF IV; 10P. Mr. Casey.

- 140f-141w-142s. Contemporary Affairs. A study of important state, national, and world problems about which the newspaper man must be informed and concerning which he must serve as interpreter. The course will aim to unify the separate social studies which students have had in other departments of the university, with a view to the focusing of these studies on contemporary questions. Prerequisites: Course 110 and 20 credits in social science. Nine credits. TTh 1:30 to 3:00; 14P. Mr. Casey, Mr. Olson, Mr. Desmond.
210. Research in Newspaper Problems. Individual research in either historical or contemporary phases of newspaper, magazine, or advertising fields. Prerequisite: Consent of department. Credits, hours, and room arranged. Mr. Casey, Mr. Olson.

LATIN

Professor Joseph B. Pike; Assistant Professor Robert V. Cram.

Prerequisites.—Any four of Courses 21-73, and 6 credits in addition selected from standard courses. A reading knowledge of French, German, or Greek is required of candidates for the Master's degree.

The degree of master of arts: For a major in Latin, any nine-credit sequence in the two hundred series, and in addition one course each quarter selected from Courses 121-133 or 241-242-243; ordinarily this latter will be required in addition to the other two hundred sequence. The student will be expected to choose for his thesis some problem connected with one of these courses. Besides, a minor is to be carried throughout the year in one of the following departments: Comparative Philology, English, German, Greek, History, Romance Languages, or Scandinavian. For a minor in Latin, any nine-credit sequence in the two hundred series or one course each quarter selected from Courses 121-133.

Candidates for the degree of doctor of philosophy in Latin will be expected to spend at least three years in preparation and will carry each quarter in addition to one seminar course and one of the courses listed below, one course in advanced Greek (i.e., in advance of three years of preparatory Greek). A knowledge of Greek and Roman history, Greek and Roman literature, and a special knowledge of a particular Latin author, or group of authors, will be required. In addition to the particular author or authors assigned the candidate will be expected to have read in the original the following list of Latin authors:

Caesar: A considerable portion of the Gallic War and the Civil War.

Catullus: All except LXIII-LXVIII.

Cicero: Fourteen orations (e.g., Roscius Amerinus, Verres Actio Prima, Imperium, Pompeii, Catilinarians I-IV, Murena, Archias, Milo, Marcellus, Ligarius, Deiotarus, Philippics II; Cato Maior, Laelius, Tusculan Disputations, Book I).

Horace: All.

Juvenal: Satires I, III, IV, VII, VIII, X, XI.

Livy: Books, I, II, XXI, XXII.

Lucretius: Books I-III, V.

Martial: At least one half.

Ovid: About four thousand verses of the *Metamorphoses*.

Plautus: *Amphitruo*, *Aulularia*, *Captivi*, *Menacchmi*, *Miles Gloriosus*, *Mossellaria*, *Rudens*, *Trinummus*.

Pliny the Younger: At least one half.

Quintilian: Book X, Ch. I.

Suetonius: Iulius, Augustus, Tiberius, Nero, Domitian.

Tacitus: *Annals* I-VI or XI-XVI.

Terence: *Adelphoe*, *Andria*, *Hautontimorumenus*, *Phormio*.

Virgil: All except the minor poems.

A preliminary written examination upon these authors and upon the history of Roman literature will be given in addition to the general written preliminary upon the graduate courses in the major completed at that time.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

121f. Advanced Virgil. Selection from the *Eclogues*, *Georgics* and from Books 7-12 of the *Aeneid*. Prerequisites: any two of Courses 51-73 or an equivalent. Three credits. MWF II; 109F. Mr. Pike.

122w. Cicero's Letters. Prerequisites: any two of Courses 51-73 or an equivalent. Three credits. Alternates with Course 132. MWF II; 109F. Mr. Pike.

123s. Medieval Latin. The course aims to accustom students to handle medieval Latin easily for historical or literary purposes. Prerequisites: any two of Courses 51-73 or an equivalent. Three credits. MWF II; 109F. Mr. Pike.

131f. Juvenal. Selection from Juvenal's work. Prerequisites: any two of Courses 51-73 or an equivalent. Three credits. Alternates with Course 121. MWF II; 109F. Mr. Pike.

132w. Seneca's Epistles. Prerequisites: any two of Courses 51-73 or an equivalent. Three credits. Alternates with Course 122. MWF II; 109F. Mr. Pike.

133s. Vulgar Latin. Lectures on vulgar Latin; selections from Petronius and Grandgent's *Introduction to Vulgar Latin*. Prerequisites: any two of Courses 51-73 or an equivalent. Alternates with Course 123. Three credits. MWF II; 109F. Mr. Pike.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. Tacitus. (Graduate seminar.) Prerequisites: seven years of Latin or any two of Courses 121-133. Nine credits. Mr. Pike.

211f-212w-213s. Graduate Seminar. Lucretius. Prerequisites: seven years of Latin or any two of Courses 121-133. Nine credits. T VIII, IX; 314Lib. Mr. Pike.

221f-222w-223s. Graduate Seminar. Cicero's Philosophical Works. Prerequisites: seven years of Latin or any two of Courses 121-133. Nine credits. Mr. Pike.

231f-232w-233s. Graduate Seminar. Cicero's Rhetorical Works. Prerequisites: seven years of Latin or any two of Courses 121-133. Nine credits. T VIII, IX; 314Lib. Mr. Pike.

241f-242w-243s. Graduate Seminar. Introduction to Classical Philology. Nine credits. Th VIII, IX. Offered yearly. 314Lib. Mr. Cram.

Note on summer school courses.—For the convenience of students who wish to secure the M.A. degree by work taken exclusively in the summer quarter the following courses are offered in successive summers:

145. Roman Tragedy. Three credits.

146. Roman Comedy. Three credits.

147. Annals of Tacitus. Three credits.

154. Elegiac Poets. Three credits.

211su-212su-213su. Lucretius. Six credits for the three summers.

LIBRARY METHODS

The course in Bibliographic Seminar (101-102)* offered by the librarian, Frank K. Walter, is recognized for general graduate credit. With the approval of the adviser, it may be counted toward any major or minor.

MATHEMATICS AND MECHANICS

Professors Raymond W. Brink, William E. Brooke, William H. Bussey, Hans H. Dalaker, William L. Hart, Dunham Jackson, William H. Kirchner, George C. Priester; Associate Professors Royal R. Shumway, Lorenz G. Straub, Anthony L. Underhill, Hugh B. Wilcox; Assistant Professors Elizabeth Carlson, Gladys E. C. Gibbens, Edward L. Hill, Willem J. Luyten.

Professor Dalaker is chairman and Professor Underhill is secretary of the group. Students majoring in Mathematics and Mechanics should consult one or the other.

Prerequisites.—For major work 10 credits in Calculus and 14 other credits in non-junior college courses.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

102s. Advanced Analytic Geometry. TThS III; 101F. Mr. Bussey.

106f. Differential Equations. Three credits. MWF III; 101F. Miss Gibbens.

107w-108s. Advanced Calculus. Three credits per quarter. MWF III; 101F. Miss Carlson.

116w. Differential Geometry. Three credits. TThS III; 101F. Mr. Underhill.

118f. Vector Analysis. Three credits. MWF VI; 101F. Mr. Hart.

* A fee of \$3 per credit is charged for this course, the payment of which relieves the student of the corresponding graduate tuition that would ordinarily be charged:

- 127f,w,s. Technical Mechanics. Five credits. Mr. Wilcox.
- 128f,w,s. Strength of Materials. Five credits. Mr. Priester.
- 130f. Open Channel Flow. Theory of uniform and varied flow in open channels, with practical applications to the design of hydraulic structures; hydraulic similitude; computations for drawdown curves, back-water curves, hydraulic jump, measuring flumes, submerged weirs, etc. Prerequisites: Courses 129 and 143. Three credits. Hrs. ar. Mr. Straub.
- 131s. Advanced Algebraic Theory. MWF VII; 101F. Mr. Hart.
- 132w,133s,134f. Advanced Hydraulic Problems. Special problems in hydraulic design. Prerequisite: 130 or registration in 130 or by special permission. Two credits per quarter. Mr. Straub.
- 144f,145w,146s. Topics in Mathematical Analysis. Three credits per quarter. Mr. Jackson.
- 151f,152w,153s. Differential Equations and Advanced Calculus Applied to Engineering Problems. Three credits per quarter. Mr. Dalaker.
- 161f,162w,163s. Advanced Technical Mechanics. Three credits per quarter. Mr. Wilcox.
- 180f,181w,182s. Advanced Strength of Materials. Three credits per quarter. Mr. Priester.
- 184f,185w,186s. Advanced Testing Materials Laboratory. Two to six credits. Mr. Priester.
- 191w. Hydraulic Motors and Pumps. Study of the hydraulic theory of the ram, impulse wheel, reaction turbine, and centrifugal pump. Prerequisite: Course 129. Three credits. Mr. Straub.
- 192w. Natural and Artificial Waterways. Wave motion, tides, ship resistance, transportation of sediment. Control and regulation of rivers, design of ship canals, locks, dry docks, movable dam, harbors. Prerequisite: Course 129 and preferably 130. Three credits. Mr. Straub.
- 193w. Hydraulic Measurements. Detailed study of the current meter, Venturi meter, weir, orifice, Parshall flume, traveling screen, chemical method of gaging, etc. Prerequisite: 129. Three credits. Mr. Straub.
- 194f,195w,196s. Advanced Hydraulics Laboratory. Special experimental studies concerning the characteristics of turbine, pumps, etc. Hydraulic models. Prerequisite: Courses 129 and 143. Two credits per quarter. Mr. Straub.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 222w,223s. Calculus of Variations. Three credits per quarter. Mr. Underhill.
- 248f,249w,250s. Reading and Research. Competent students will be assisted in independent reading and reports, by members of the department. One to three credits per quarter.
- 251f. Theory of Functions of Infinitely Many Variables. Three credits. Mr. Hart.
- 261f,262w,263s. Theory of Function of a Complex Variable. Three credits per quarter. Mr. Dalaker.

- 271f,272w,273s. Theory of Linear Differential and Integral Equations.
Three credits per quarter. Mr. Brink.
- 284f,285w,286s. Advanced Hydrodynamics. Prerequisite: Course 293.
Three credits per quarter. Mr. Brooke.

The following courses have been offered from time to time in the past, and similar courses or other courses of corresponding grade, will be provided at any time when there is sufficient demand for them.

- 102f,103w,104s. Advanced Analytic and Synthetic Geometry.
114. The Mathematics of Small Vibrations.
- 115,116,117. Differential Geometry.
- 118,119,120. Vector Analysis.
- 121,122,123. Mathematical Theory of Statistics.
141. Projective Geometry.
142. Theory of Invariants.
- 206,207,208. Theory of Functions of Real and Complex Variables.
- 221,222,223. Calculus of Variations.
- 254,255,256. Modern Analysis (Based on Whittaker and Watson's Text).
- 267,268,269. Advanced Dynamics. Vol. II Routh's *Dynamics*.
- 274,275,276. Dynamics of a Particle.
- 277,278,279. Advanced Statics.
- 281,282,283. Hydrodynamics.
- 294,295,296. Theory of Elasticity.
- 297-298. Vibration Problems.
- The Theory of Numbers.
- The Galois Theory of Equations.
- Higher Plane Curves.
- The Calculus of Finite Difference.
- Modern Theories of Integration.
- Advanced Descriptive Geometry.
- Perspective.
- Fourier's Series and Spherical Harmonics.
- Advanced Analytic Geometry of Space.
- Elliptic Functions and Integrals with Application.
- Limits and Series.

The following courses given in the Department of Physics and the Department of Astronomy may count for credit in this department.

- Physics 201f,203w,205s
207f,209w,211s
221f,223w,225s

Astronomy 111f,112w,113s.

MECHANICAL ENGINEERING

Professors John R. DuPriest, Frank B. Rowley, Charles F. Shoop; Associate Professors Charles A. Koepke, John V. Martenis, Burton J. Robertson.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f-122w-123s. Advanced Engineering Design. Problems selected to suit the student's special interest. Automatic machines; machines for quantity production; materials handling and heavy plant equipment. Drafting and problems. Prerequisite: Course 24. Two credits per quarter. Ar.

STEAM ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 136w. Design of Steam Machinery. Piping systems, furnace and gas passage dimensions, stokers, oil, gas and pulverized fuel burners, superheaters, feedwater heaters and pumps, air pre-heaters, automatic controls, chimneys, etc. Prerequisite: Course 144. Two credits. T VII-IX, S I-III; 151ME. Mr. Shoop.
- 142w. Steam Turbines. Theory and practice applied to various types. Thermodynamics and mechanical analysis of problems involved in the design of nozzles, blades, rotors, etc. Condition of operation; systems of transmission; lubrication; economy; field of service. Laboratory investigation. Prerequisite: Course 32. Three credits. MWF IV; 209Ex. Mr. Shoop.
- 144f. Power Plant Machinery. Power plant engineering. Theory, practice, and economics relating to prime movers and steam generating equipment of the modern power plant including auxiliary units, such as condensers, heaters, purifiers, pumps, fans, piping, etc. Prerequisite: Course 32. Three credits. MWF IV; 254ME. Mr. Shoop.
- 145w. Applied Thermodynamics. Laws of heat transmission, mean temperature difference, in condensers, boilers, brine coils, feed water heaters. Treatment of cooling towers, accumulators, multiple stills, stage evaporators, vapor refrigeration; air compressors, multi staging, intercooling, etc. Prerequisite: Course 32. Three credits. MThF III; 209Ex. Mr. Shoop.
- 146s. Fuels and Combustion. Fuels: classification and analyses. Hand and stoker treatment; regulation. Pulverized and liquid fuels. Types of burners, controls. Combustion: generation of heat; furnace gases; stratification; flame way; smoke prevention. Furnaces. Lectures and recitations. Prerequisite: Course 30. Three credits. MWF IV; 209Ex. Mr. Shoop.
- 149f,w.s. Advanced Steam Laboratory. Tests of steam turbines, uniflow and compound steam engines, condensers, evaporators, and vacuum pumps. Tests of compound steam pump. Air compressor, boiler, superheater, and power plant. Studies of fluid flow meters and air-conditioning apparatus. Prerequisites: Courses 32 and 35. Two credits. Mr. Shoop.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 241f. Advanced Thermodynamics. Reversible changes of state and efflux of wet and superheated vapors. Flow of compressible fluids in mains,

- moving channels, into receivers, and communicating vessels. Gas mixtures, critical points, liquefaction. Power plant cycles: regenerative, reheating, and bleeding. Prerequisite: Course 32. Two credits. Mr. Shoop.
- 242f-243w. Power Plant Design. Problems, designs, and estimates for power plants and central stations. Selection of motive powers, relative advantages of steam, producers, and gas plants. Choice of engines and boilers; pumps, piping, and accessories. Prerequisite: Course 137. Two credits per quarter. Mr. Shoop.
- 244s. Power Plant Management. Operation and maintenance of boilers, engines, steam turbines, and accessory apparatus. Smoke prevention, lubricants, and lubrication. Power plant finance. Daily logs and power costs. Study of recent power researches. Prerequisite: Course 144. Three credits. Mr. Shoop.

INTERNAL COMBUSTION ENGINES

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 150f. Internal Combustion Engines. Laws of gases; gas cycles, Otto, semi-Diesel, and Diesel engines. Mechanism of various types. Carburetion, governing, cooling, lubrication. Combustion. Gas producers. Prerequisites: Courses 30, 31. Three credits. Sec. 1, MThF I, 254ME; Sec. 2, MWF II, 254ME. Mr. Robertson.
- 151w. Advanced Internal Combustion Engines. Special reference to automobile, truck, and airplane engines. Theoretical consideration of fuels, combustion, detonation, lubrication, etc. Prerequisite: Course 150. Three credits. MWF I; 209Ex. Mr. Robertson.
- 152s. Aero Engine Testing. Use of modern research instruments and methods for testing. Experiments showing effect of fuel mixture, distribution, spark timing, etc., upon general engine performance. Prerequisite: Course 151. Two credits. TF VII-IX; Ex. Mr. Robertson.
- 153s. Automobile Fleet Maintenance. Study of available types of motor coaches and trucks, their design features from a maintenance viewpoint, a survey of service depot requirements with a study of fleet service methods and maintenance practice. Lectures and recitations. Prerequisite: Course 150. Three credits. Mr. Robertson.
- 155s. Internal Combustion Engines. Laws of gases; gas cycles, Otto, semi-Diesel, and Diesel engines. Carburetion, cooling, lubrication, and governing. Gas producers and power plants. Prerequisite: Course 139. Three credits. Mr. Robertson.
- 156w-157s. Design of Internal Combustion Engines. Calculations of inertia forces and size of cylinders for automobile, aircraft, and stationary service. Theoretical diagrams and details of parts. Prerequisite: Course 150. Two credits. Mr. Robertson.
- 159f,w,s. Internal Combustion Engine Laboratory. Tests of gasoline, semi-Diesel, and Diesel engines. Power plant units and automotive engines. Prerequisite: Course 150 or reg. in 150. Two credits. Mr. Robertson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 251f-252w-253s. Automobile and Motor Truck Design. Theory and design of the automobile, motor truck engine, and chassis, complete design of engine, transmission, and chassis. Lecture and drawing room. Two credits per quarter. Mr. Robertson.
- 254s. Gas Tractor Design. Selection of wheel sizes; horse power weight and drawbar pull. Bearing pressures; ratios and strength of gearing. Details of principal parts. Prerequisite: Course 156. Two credits. Mr. Robertson.
- 255f-256w-257s. Automobile Testing and Research. Dynamometer and road tests including over-all efficiency of cars at various speeds, fuel consumption, effect of road surface on traction, efficiencies, and general performances. Special research problems. Prerequisite: Course 155 or 159. Two credits. Mr. Robertson.
- 258s. Motor Truck and Bus Transportation. Problems involving motor truck transportation, capacity of trucks, trailers, drawbar pull. Efficiencies. Effect of road surface. Freight handling. Analysis of costs of truck operation and maintenance. Relative costs of transportation. Prerequisite: Course 152. Three credits. Mr. Robertson.

HEATING, VENTILATION, AND REFRIGERATION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 163f. Heating and Ventilation. Principles of heating and ventilation including the design and layout of warm air, steam, hot water, vapor, vacuum, and fan systems of heating. Requirements and design of ventilating systems. General principles of central station heating. Recitations, lectures, and designs. Prerequisites: M.&M. 127, 128, 129. Four credits. MWF II, 252ME; W VI-IX, 255ME. Mr. Rowley.
- 164s. Heating and Ventilation. Principles of heating and ventilation. Heating systems; furnaces, steam, hot water, vapor, vacuum, and fan blast. Piping systems. Ventilation; humidification, synthetic air chart. Temperature regulation. Prerequisite: M.&M. 92. Two credits. TTh I; 215Ex. Mr. Rowley.
- 165f,w. Advanced Heating and Ventilation. Special selected problems. Prerequisite: Course 63. Three credits. MWF I; 252ME. Mr. Rowley.
- 166s. Compressed Air and Refrigerator Machinery. (a) Air compressors and motors; power transmission by compressed air. (b) Principles of refrigeration. Various types of refrigerating machines, refrigerants, applications to ice making, cold storage, cooling of air, liquids, and solids. Lectures and recitations. Prerequisite: Course 141. Three credits. MWF I; 202ME.
- 167w. Advanced Heating and Ventilation. Prerequisite: Course 165. Three credits. MWF IV; 154ME. Mr. Rowley.
- 169f,w,s. Heating and Ventilation Laboratory. Tests of heating, ventilating, and air conditioning equipment. The determination of air quali-

ties as required for comfort and for specific industries. Tests and studies of complete installation. Prerequisite: Course 32. Two credits. Mr. Algren.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 265f,w,s. Advanced Heating and Ventilation. Taken in connection with research work in the laboratory. Prerequisite: Course 63. Credits arranged. Open to graduates only. Mr. Rowley.
- 267w. Mechanical Equipment of Buildings. Selection of heating, ventilating, and plumbing systems for various types of buildings. Piping layouts, for fire protection, air, gas, and vacuum cleaning systems, elevators. Designs and layout of equipment. Lectures and drafting. Prerequisites: Course 63, Phys. 43. Three credits. Mr. Martenis.

INDUSTRIAL ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 171f. Production Factors. Principles and practice involved in economical production. Standardization. Requirements for uniformity and interchangeability. Jigs, fixtures, and special equipment; gases and inspection systems. Divisions of labor. Conveying, handling, and stores control. Fatigue elimination. Prerequisite: open to seniors who have had Course 15. Three credits. Sec. 1, MWF III, 254ME; Sec. 2, MWF IV, 202ME. Mr. Koepke.
- 172w. Industrial Plants. Factory organization and construction for economical manufacture. Organization of the industry. Location and type of buildings, power development. Layout of plant. Routing systems and machine layout. Heating and ventilating requirements. Lighting. Sanitation. Distribution of power. Welfare features. Lectures, recitations, and drawing room practice. Prerequisite: Course 171. Three credits. MWF IV; 202ME. Mr. Koepke.
- 173s. Industrial Management. General principles. Taylor system; wage, bonus, and profit sharing systems. Maintenance and depreciation. Purchasing. Allocation of cost, overhead, and machine burden. Graphical representation. Prerequisite: Course 172. Three credits. MWF I; 154ME. Mr. Koepke.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 274f. Industrial Management Laboratory. Planning department. Time and motion studies; rate setting. Instruction cards. Production control. Shop practice with investigations in local factories. Lectures, assigned reading, practice, and reports. Prerequisite: Course 173. Three credits. MWF I; 154ME. Mr. Koepke.
- 275w. Industrial Management. Labor administration. Foreman training. Training the worker; job analysis. Employment and turnover; the human element, service departments. Stabilization of labor. Lectures, reading, shop visits, and reports. Prerequisite: Course 274. Three credits. MWF I; 202ME. Mr. Koepke.

- 276s. Safety Engineering. Safety of the worker; fire and other hazards; prevention of industrial accidents. Compensation laws. Fire prevention; construction; automatic sprinkler systems. Effect of safety on production. Factory sanitation. Safety organization. Lectures, assigned reading, factory inspections, and reports. Prerequisite: Course 171. Three credits. Mr. Koepke.
- 277f-278w-279s. Industrial Engineering Problems. Special investigations of practical problems and suggested methods of procedure. Lectures, assigned reading, shop visits, and reports. Prerequisites: Course 274, 275, or reg. in 274, 275. Three credits per quarter. Mr. Koepke.

NAVAL ARCHITECTURE

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 185f,w,s. Theoretical Naval Architecture. Ship measurement; stability and trim; resistance, coefficients, speed, and powering. Two credits. Preferably preceded by Course 85.
- 186f,w,s. Theoretical Naval Architecture. Strength of ship as a whole, and of various parts of the ship under local stresses; effect of rolling, pitching, and vibration. Two credits.
- 187f,w,s. Ship Drawing. Preliminary design of commercial ships, including consideration of mechanical equipment, with special emphasis on river and lake transportation. Prerequisites: Courses 185, 186. Two credits.

HYDRAULIC MACHINERY

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 189s. Hydraulic Machinery. Theory of operation, design, construction, and regulation of water turbines. Turbine testing; characteristics, selection of type. Cost of turbines and water power. Prerequisite: M.&M. 129. Three credits. MWF IV; 154ME.

RAILWAY MECHANICAL ENGINEERING

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 281f. Railway Technology. Systematic course of visits to the various railroad shops in the vicinity to study locomotive details and classifications. Locomotive practice. Lectures and reports. Prerequisites: M.&M. 127, 128, 129. One credit. Mr. Martenis.
- 282f-283w-284s. Locomotive Design and Construction. Locomotive details. Design of boiler, cylinders, frame, springs, trucks, axles, wheels, running gear, equalizing arrangements, valve gears, lubrication. Lectures, assigned reading, and drafting. Prerequisite: Course 271. Three credits per quarter. Mr. Martenis.

SEMINAR AND RESEARCH

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 190f-191w-192s. Seminar. Reading of assigned articles in current technical press. Classroom presentation of principal features of assigned articles. One credit per quarter. Mr. DuPriest, Mr. Robertson.
- 290f-291w-292s. Mechanical Engineering Research. Courses may be elected which involve investigations in connection with lubrication, fuels, furnaces, boilers, steam engines, turbines, gas engines, heating and ventilation, industrial and other engineering problems. Reports, special problems, and related tests. Credit arranged. Mr. DuPriest, Mr. Rowley, Mr. Shoop, Mr. Koepke, Mr. Martenis, Mr. Robertson.

MEDICAL SOCIAL WORK

For statement of prerequisites and of graduate courses and staff, see Sociology.

MEDICINE

(Including General Medicine, Dermatology, and Nervous and Mental Diseases)

The graduate work in the Department of Medicine is designed to prepare students for practice of the specialty of internal medicine, research in the problems of general medicine, and for the specialty of nervous and mental diseases, as the case may be, and to train men as teachers in their respective fields. Prospective students who have had no special work in addition to that of the undergraduate course in physiology, physiologic chemistry, therapeutics, experimental medicine, or pathology are advised to devote a year or more to these subjects before entering the regular three-year graduate course. Throughout the course it is recommended that a minor be carried in one or more of the following departments: Physiology, Pharmacology, Pathology, Immunology, and Pediatrics. For students specializing in nervous and mental diseases, minors in anatomy and psychology are especially valuable, and for those desiring it, work would be arranged in the Department of Ophthalmology and Oto-laryngology, giving a special opportunity to study lesions of the eye occurring in systemic disorders. In the Medical School, during at least the third year of the three-year fellowship, the fellow acts as an officer of the clinic with definite responsibility in the care of patients in the University Hospital.

For courses of study see special bulletin of graduate courses in medicine.

METALLOGRAPHY

Professor Ralph L. Dowdell.

Prerequisites.—For major work, adequate preparation in the sciences fundamental to metallography (chemistry, physics, geology, technical subjects), the general requirements being fulfilled. For minor work, the prerequisites to the courses to be pursued.

Exemption from the language requirements for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 150f. Metallography for Electrical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; study of typical alloys with special reference to electrical resistance, conductivity, magnets, etc. Laboratory work and demonstrations. Two lectures, three laboratory hours per week. Three credits. MW I; 315M. W VI, VII, VIII; 307M. Mr. Forsyth.
- 151w. Advanced Metallography for Electrical Engineers. Continuation of 150. Two lectures, three laboratory hours per week. Prerequisite: Course 150. Three credits. MW I; 315M. W VI-VIII; 307M. Mr. Forsyth.
- 152f. Metallography for Aeronautical Engineers. Principles; metallography of iron and steel with special reference to alloy steels, and light alloys used in airplane construction. Laboratory work and demonstrations. Open to senior aeronautical engineers. Three credits. Lect. TS I; 315M; lab. M VII-IX; 307M. Mr. Jerabek.
- 153f-154w-155s. Metallography. (Long course for metallurgical engineers.) Theory of metallic alloys. Metallographic technique. Properties of metals and alloys. Metallography of iron and steel and commercial alloys. Technical metallography. Three lectures, four laboratory hours per week each quarter. Prerequisites: Chem. 9w, Phys. 43 or Mechanics 53. Five credits per quarter. MWF VI or VII; 305M. T VI-IX; 307M. Mr. Forsyth.
- 156w. Metallography for Mechanical Engineers. Similar to 150 but specially arranged for students in mechanical engineering. Two lectures, three laboratory hours per week. Three credits. ThS III; 112M. W VII-IX; 307M. Mr. Dowdell.
- 157s. Advanced Metallography for Mechanical Engineers. Continuation of 156. Two lectures, three laboratory hours per week. Prerequisite: Course 156. Three credits. MW I, F VII-IX; 307M. Mr. Dowdell.
- 160f. Metallography for Chemical Students. Principles of metallography, including constitution diagrams, preparation and standardization of thermocouples, preparation and thermal analysis of alloys, microscopic examination and making of photomicrographs; typical alloy systems as iron carbon (steel and cast iron), some non-ferrous alloys. Prerequisite: Anal. Chem. 1 and 2. Two lectures and 3 laboratory hours per week. Three credits. MF III; 112M. Th or F VI-VIII; 307M. Mr. Jerabek.
- 161w. Advanced Metallography for Chemical Students. Metallography and heat treatment of iron and steel, including alloy steels, commercial uses of various steels, and engineering specifications. Prerequisite: Course 160. Two lectures and three laboratory hours per week. Three credits. MF I; 112M. Th VI-VIII; 307M. Mr. Jerabek.

- 162s. Advanced Metallography for Chemical Students. Metallography of the non-ferrous metals with a study of the constitution diagrams, properties, and uses of important commercial alloys. Prerequisite: Course 160. Two lectures and three laboratory hours per week. Three credits. MF III; 112M. Th VI-VIII; 307M. Mr. Jerabek.
- 163f. Advanced Metallography. Seminar work on recent advances in metallography. Lectures and recitations, with outside reading and special reports. May be accompanied by laboratory work. Prerequisites: Courses 151, 155, 157, or equiv. Credits and hours arranged. 305M. Mr. Dowdell.
- 164w. Advanced Metallography. Advanced consideration of the structures, properties, and uses of metals and alloys. May be accompanied by laboratory work. Prerequisites: Courses 151, 155, 157, or equiv. Credits and hours arranged. 305M. Mr. Dowdell.
- 165s. Advanced Metallography. Technical metallography as applied to the automotive industry. Lectures and special reports. May be accompanied by laboratory work. Prerequisites: Courses 151, 155, 157, or equiv. Credits and hours arranged. 305M. Mr. Dowdell.
- 163f-164w-165s. Laboratory. Laboratory work on special problems in ferrous, non-ferrous, and X-ray metallography. Credits and hours arranged. Mr. Dowdell.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Advanced Metallography for Graduate Students. Intended primarily for research work. Credits and hours arranged. 305M. Mr. Dowdell.

METALLURGY

Professors Peter Christianson, Levi B. Pease.

Prerequisites.—Elements in physics and chemistry.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 104w. Metallurgy of Pig Iron and Wrought Iron. General underlying principle of iron ore reduction, including construction, operation, and regulation of the iron blast furnace together with direct reduction of iron ore and refining products in the hearth and puddling furnaces. Prerequisite: General Metallurgy 3f. Three lectures and one consultation hour per week. Three credits. TThS I; 108M. Mr. Christianson.
- 105s. Metallurgy of Steel. General principles involved in the refining and purification of pig iron and scrap into various grades of steel. Three lectures and one consultation hour per week. Three credits. TThS I; 108M. Mr. Christianson.
- 106f. Metallurgy of Base Metals. Lead, copper, zinc. Consideration of methods and principles involved in roasting, smelting, and refining base metals. Hydrometallurgy and electrolytic refining. Four lectures per week. Three credits for graduates. TThS III; F I; 108M. Mr. Pease.

- 107w. Metallurgy of Base Metals. Continuation of Course 106f. Four lectures per week. Three credits. Mr. Pease.
- 108s. Metallurgy of Precious Metals. Principles involved and methods used in the extraction of gold, silver, and other precious metals. Cyanidation, amalgamation and refining. Four lectures per week. Three credits. TThS III; F IV; 108M. Mr. Pease.
- 110f-111w. Ore Dressing. General principles involved in the crushing, sizing, gravity separation, flotation and magnetic concentration of ores. Three credits. Lectures, MWF III; conferences; 202M. Mr. Pease.
- 112f-113w-114s. Ore Dressing Laboratory. Practical examination of ores. Operation of laboratory ore dressing equipment. Laboratory concentration of common ores. Two credits. Laboratory and conference. Th VI-IX. Mr. Pease.
- 117w. Advanced Metallurgy. Metallurgical calculations to determine heat balance and heat distribution in furnaces. Four lectures and six laboratory hours per week. Four credits. TWThFS II, Th VI, VII, VIII, IX; 108M. Mr. Christianson.
- 118s. Advanced Metallurgy. Designs of furnaces together with laboratory work. Consultations. Hours same as 117s. 108M. Mr. Christianson.
- 123f. Electrometallurgy. Application of electricity to the production of heat for the smelting of ores and refining of metals. Relative cost of fuel and electric heating; also relative efficiencies of fuel and electric furnaces. Construction of high temperature furnaces and operation of commercial plants. Three lectures and one consultation hour per week. Three credits. MW I, S IV; 108M. Mr. Christianson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 204f-205w-206s. Thesis Courses for Graduate Students. Intended primarily for research work. Credits and hours arranged. Mr. Christianson, Mr. Pease.
- 207-208-209. Special Problems in Metallurgy. Seminar work on metallurgical problems. Credits and hours arranged. Mr. Christianson, Mr. Pease.
- 210-211-212. Special Problems in Advanced Metallurgy. Intended primarily for research work. Credits and hours arranged. Mr. Christianson, Mr. Pease.

OBSTETRICS AND GYNECOLOGY

For staff and courses of study offered, see special bulletin of graduate work in medicine.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PATHOLOGY

Prerequisites.—Graduate students who desire to take their major or minor work in pathology must present credits in the following subjects: physics, 8 credits; general and organic chemistry, 12 credits; zoology, 6 credits; and a reading knowledge of German.

In addition, students who elect their major work in pathology must present credits for the equivalent of the first two years' work of the Medical School of this University.

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PEDIATRICS

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PHARMACOLOGY AND THERAPEUTICS

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PHILOSOPHY

Professors Norman Wilde, David F. Swenson; Associate Professor George P. Conger.

Prerequisites.—For a major, 18 credits; for a minor, 9 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f. History of Religions. Prerequisite: 10 credits. Three credits. TThS II; 322F. Mr. Conger.
- 101w. Psychology of Religion. Prerequisite: 10 credits. Three credits. TThS II; 322F. Mr. Conger.
- 102s. Philosophy of Religion. Prerequisite: 10 credits. Three credits. TThS II; 322F. Mr. Swenson.
- 103s. Esthetics. Prerequisite: 10 credits. Three credits. MWF II; 322F. Mr. Swenson.
- 104s. History of Esthetic Theory. Prerequisite: 10 credits. Three credits. MWF II; 322F. (Alternates with 103.) Mr. Swenson.
- 108f-109w-110s. History of Ethics. Prerequisite: 20 credits in any social science or 10 credits in philosophy. Six credits. TS IV; 322F. Mr. Wilde.
- 115w. Contemporary Philosophy. Prerequisite: Philosophy 50, 51, or 52. Three credits. MWF III; 322F. Mr. Conger.
- 120w. Scandinavian Philosophy. Prerequisite: 10 credits. Three credits. MWF VI; 322F. Mr. Swenson.
- 124f. Political and Social Ethics. Prerequisite: 20 credits in any social science, or 10 in philosophy. Five credits. MWThFS I; 322F. Mr. Wilde.

- 129w. Modern Political Thought. Prerequisite: 10 credits in philosophy, or 20 credits in any social science. Five credits. MWThFS I; 322F. Mr. Wilde.
- 135w-136s. The Philosophy of Plato. Prerequisite: 10 credits. Six credits. MWF VIII; 339Lib. Mr. Swenson.
- 141s. Metaphysics. Prerequisite: 10 credits, including Philosophy 2. Five credits. MTWFS III; 322F. Mr. Conger.
- 147f-148w. Advanced Logic. Prerequisite: 10 credits, including Philosophy 2. Six credits. MWF II; 322F. Mr. Swenson.
- 151f-152w. Modern Idealism. Prerequisite: 15 credits. Six credits. MWF VIII; 338Lib. Mr. Swenson.
- 161f-162w-163s. Seminar in Philosophy. Individual investigation, topics to be determined after consultation with the department. Prerequisite: 20 credits. Nine credits. Mr. Wilde, Mr. Swenson, Mr. Conger.

PHYSICS

Professors Henry A. Erikson, Louallen F. Miller, John T. Tate, Anthony Zeleny; Associate Professors J. William Buchta, Joseph Valasek; Assistant Professor Edward L. Hill.

Prerequisites.—For major work, differential and integral calculus and two years of physics of college grade. For minor work, one year of college physics.

A student majoring in physics is required to take Courses 101-103-105 and 52 unless excused by the department upon satisfactory evidence at entrance. A course of general reading as outlined by the department in each case is also advised.

For the Master's degree a reading knowledge of French or German is required. It is desirable that this requirement be fulfilled before graduate work is begun. For the Ph.D. degree a reading knowledge of both French and German is required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-103w-105s. Theoretical Physics. An analytical survey of fundamental principles of mechanics, sound, heat, light, electricity, and magnetism designed to supplement the general courses and to prepare students for more specialized courses. Five lectures a week. Prerequisites: 12 credits in physics, Math. 51. Five credits per quarter. MTWFS IV; 145Ph. Mr. Tate.
- 104w. Precision Mechanics. Standard methods of precise measurements of length, mass, and time. Two three-hour sessions a week. Prerequisites: 12 credits in physics, Math. 51. Three credits. Hrs: ar. Mr. Buchta.
- 114f-116w-118s. Elementary Physical Investigation. The experimental or theoretical study of physical phenomena the nature or laws of which are not as yet understood. Prerequisites: Physics 105 or equivalent, Math. 51. The work in this course requires the submission of a writ-

- ten report on the work accomplished. Three credits per quarter. Hrs. ar. Staff.
- 115f-117w-119s. Problem Course. The work of this course consists entirely in solving problems and exercises designed to give practice in the mathematical analysis of physical problems. Prerequisites: Phys. 105. Math. 51. Three credits per quarter. Mr. Buchta.
- 124f,s.* Pyrometry. A theoretical and experimental study of different principles involved in temperature measurement, covering standardization and calibration with some practical considerations. Prerequisite: 12 credits in physics. Three credits. MWF VI-IX; 244Ph. Mr. Miller.
- 126s. Advanced Heat. A theoretical and experimental study of heat phenomena such as comparative calorimetric methods, temperature regulators, ratio of specific heats of gases, conductivities and radiation. Prerequisite: 12 credits in physics. Three credits. Mr. Miller.
- 134f,w.* Experimental Optics. Special experimental work in spectrometry, optical instruments, photometry, absorption, polarized light. Two three-hour laboratory periods a week. Prerequisite: Course 34. Three credits. Hrs. ar. Mr. Valasek.
- 136w,s.* Spectrum Analysis. An experimental course dealing with the measurement of wave lengths, intensities, and absorption coefficients in the infra-red, visible, and ultra-violet regions of the spectrum. Two three-hour laboratory periods a week. Prerequisite: Course 34. Three credits. Hrs. ar. Mr. Valasek.
- 144f.* Electrical Measurements. Devoted mainly to the study of potentiometer methods, capacity, inductance, magnetic flux. Three two-hour laboratory periods a week. Three credits. See engineering program. Mr. Zeleny.
- 146w.* Electrical Measurements of Precision. Precision measurements of electromotive force, current, resistance, capacity, inductance, and magnetic flux. Use of apparatus of highest precision. Three two-hour laboratory periods a week. Prerequisite: Course 144. Three credits. Hrs. ar. Mr. Zeleny.
- 148s.* Radioactivity. An analytical study of the theories and methods of investigation supplemented by laboratory technique. Those pursuing this course should continue with Chemistry 151, Radiochemistry. Prerequisites: Courses 43 and 44. Three credits. TTh VII, VIII, IX. Mr. Erikson.
- 150w.* Conduction through Gases. An analytical study of the theories and methods of investigation, supplemented by laboratory technique. Prerequisites: Courses 43 and 44. Three credits. TTh VII, VIII, IX. Mr. Erikson.
- 152f. X-Rays. A study of the nature and production of X-rays. Prerequisites: Courses 43 and 44. Three credits. TThS I; 133Ph. Mr. Erikson.
- 154s. X-Ray Spectroscopy. Theory of diffraction of X-rays by crystals. Emission and absorption spectra. Theory and systemization of X-ray

* A laboratory fee of \$2 is charged for this course.

spectra. Satellites of diagram lines. Effects of chemical combination. Lectures combined with laboratory work. Prerequisites: Physics 152 and permission of instructor. Three credits. Hrs. ar. Mr. Valasek.

COURSES PRIMARILY FOR GRADUATE STUDENTS

Physics 101-103-105 and Mathematics 51 and prerequisites for all the courses listed below. All the courses have as many lectures per week as credits.

201f. Kinetic Theory of Matter. Distribution of velocities, equation of state and transfer phenomena in gases. Crystal physics from the molecular standpoint. Three credits. MWF IV; 166Ph. Mr. Hill.

203w. Statistical Mechanics. Theory of probability and its application to mechanics. Brownian movement and other fluctuation phenomena. Three credits. MWF IV; 166Ph. Mr. Hill.

205s. Thermodynamics. The three laws and their application to physical and chemical problems. Three credits. MWF IV; 166Ph. Mr. Hill.

Courses 201-211 form a cycle which will be covered in two years. Those to be given in 1931-32 are 201f, 203w, 205s.

207f. Advanced Dynamics. The general methods of Lagrange, Hamilton and Jacobi. Variation principles. Perturbation theory. Three credits. MWF IV; 166Ph. Mr. Hill.

209w-211s. Electrodynamics. Electrostatics, magnetostatics, and electrodynamics based on the restricted principle of relativity. Applications to theories of the electric and magnetic properties of matter. Three credits per quarter. MWF IV; 166Ph. Mr. Hill.

221f-223w-225s. Modern Theoretical Physics. Quantum mechanics and its applications to atomic and molecular spectra, Compton effect, dispersion, etc. Three credits per quarter. MWF III. Mr. Hill.

231f. Electromagnetic Theory Applied to Optical Phenomena. Reflection and refraction by transparent substances, metals, and crystals. Optical properties of matter. Three credits. Hrs. ar. Mr. Valasek.

233w. Wave Optics. Interference, diffraction, and polarization, with applications to experimental spectroscopy. Diffraction of X-rays by crystals. Three credits. Hrs. ar. Mr. Valasek.

235s. Radiation Theory. Thermal radiation and luminescence. Optical phenomena due to motion. Introduction to the theory of relativity. Geometrical optics. Compound lenses and optical instruments. Three credits. Hrs. ar. Mr. Valasek.

241f-243w-245s. Contemporary Experimental Physics. Discussion of fields of investigation which are of present interest and importance. Three credits per quarter. Mr. Tate, Mr. Buchta, Mr. Valasek.

252f-254w-256s. Research. Under the special direction of individual members of the staff.

261f-263w-265s. Seminar. Study of present day problems in physics. Three credits. One hour a week. Open to those who are doing graduate work in physics. Mr. Tate.

The following courses will be offered provided at any time there is sufficient demand for them:

Hydrodynamics and Theory of Elasticity.
 Advanced Topics in Electron Theory and the Special Theory of Relativity.
 The General Theory of Relativity.
 Advanced Quantum Theory.
 The Partial Differential Equations of Mathematical Physics.
 Applied Electricity—Theory of Electrical Circuits.

PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

Prerequisites.—The Department of Physiology is well equipped for the various types of physiologic investigation. The library facilities are good.

For a minor in physiology, general zoology, general and organic chemistry, and college physics are prerequisites. (In exceptional cases high school physics may be accepted.) For a major, physical chemistry is desirable.

In addition, each student majoring in physiology or physiologic chemistry must have had the general courses, Physiology 100, 101, 103, 104, or the equivalent.

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PLANT BREEDING

Plant breeding may be elected as a field for either major or minor work. For prerequisites for specialization and statement of courses of study see announcement under Agronomy and Plant Genetics.

PLANT PATHOLOGY AND BOTANY

Professors Edward M. Freeman, Elvin C. Stakman; Associate Professor Julian G. Leach; Assistant Professor Jonas J. Christensen; Instructor Louise T. Dossall.

Note.—For courses in botany including plant physiology see also Department of Botany.

Prerequisites.—The minimum requirement is (a) three years (27 credits) in the plant sciences; (b) general bacteriology one quarter (4 credits) or some equivalent; (c) one year (9 credits) in plant pathology—preferably two years (18 credits), including mycology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

105f-106w-107s. Mycology. Morphology, taxonomy, and biology of fungi. Lecture, laboratory, greenhouse, and field work. Prerequisites: Botany 1 and 2 or equivalent. Three or five credits per quarter. TTh VI, VII, VIII; 302PP. Mr. Freeman, Miss Dossall.

- 111w. Diseases of Cereal Crops. Symptomatology, etiology, and practical methods of control. Laboratory, lecture, and field work. Prerequisite: Course 1 or 10. MWF VI, VII; 106,107PP. Mr. J. J. Christensen.
- 112s. Diseases of Fruit Crops. Especially those important in Minnesota. Laboratory, lecture, and greenhouse work. Three credits. MWF VI, VII; 106,107PP. Mr. Leach.
- 113s. Diseases of Vegetable Crops. Diseases of potatoes and other vegetable crops. Lecture, reference, laboratory, and greenhouse work. Three credits. MWF VI, VII; 106,107PP. Mr. Leach.
- 114w. Advanced Forest Pathology. Wood rots, including a study of the deterioration of wood products caused by fungi. Lectures, laboratory, and greenhouse work. Three credits. MWF VIII, IX; 106,107PP. Mr. Stakman, Mr. Clyde Christensen.
- 116f. Pathologic Histology. A study of the histological changes in diseased plants. Lectures, laboratory, and reference work. Prerequisite: Course 1 or 10. Three credits. MWF III, IV; 106,107PP. Mr. Leach.
- 117s. Diseases of Forage and Fiber Crops. Symptomatology, etiology, and methods of control. Lectures, laboratory, and field work. Prerequisite: Course 1 or 10. Three credits. MWF III, IV; 106, 107PP. Mr. J. J. Christensen, Mr. Allison.
- 118f. Bacterial Diseases of Plants. Bacteria as plant pathogens; representative types with particular reference to the technique used in studying bacterial diseases of plants. Lectures, laboratory, and greenhouse work. Three credits. Prerequisites: Course 1 or 10 or Bact. 51. Ar. Mr. Leach.
- 119s. Principles of Plant Disease Control. Methods of plant disease control by means of exclusion, eradication, protection, and immunization. Lectures, laboratory, and reference work. Prerequisite: Course 1 or 10. Three credits. Ar. Mr. J. J. Christensen, Mr. Allison.
- 141f-142w. Insects in Relation to Plant Diseases. A study of the principal insect vectors and their habits; types of insect injuries affecting health of plants; modes of insect transmission and dissemination of plant disease; methods of rearing and handling insect vectors. Of interest to students in Entomology, Plant Pathology, Horticulture, Forestry, and Agronomy. Prerequisite: Entomology, 8 credits, and Plant Pathology, 8 credits, or consent of instructors. Six credits. TThS III, IV; 302Ad. Mr. Leach, Mr. Granovsky.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 203f-204w-205s. Research in Plant Pathology. Special assignment of work in laboratory and field problems in pathological research. Mr. Freeman, Mr. Stakman, Mr. Leach, Mr. J. J. Christensen, Miss Dossdall.
- 207f-208w-209s. Research in Mycology. Research work along following suggested lines: taxonomy of natural groups; fungous flora of particular regions, localities, or habitats; investigation of fungi involved in special industrial or natural processes; morphology or physiology of

- special forms. Prerequisite: Course 105-106-107. For minor or major. Three credits per quarter. Mr. Freeman, Mr. Stakman, Miss Dosdall.
- 211w. History of Plant Pathology. Development of important mycological, pathological, and physiological researches; historical basis of modern science of plant pathology. Two credits per quarter. Mr. Stakman.
213. Seminar. Assigned topics with special reference to current pathological problems. Historical review of literature on special problems and critical study of current literature. Two credits per quarter. Ar.; 400PP. Mr. Stakman.
- 214w. Principles of Pathology. Physiology of plant pathogenes; pathological plant anatomy, parasitism, biologic specialization, resistance, and immunity. Prerequisites: Course 1 or 10 and Bact. 51. Three credits. MWF III, IV; 400PP. Mr. Stakman, Mr. Allison.

PLANT PHYSIOLOGY AND AGRICULTURAL BOTANY

Associate Professor Rodney B. Harvey.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 160w. Plant Microchemistry. The localization, identification, and function of plant constituents. Lecture, demonstration, and laboratory. Prerequisite: organic chemistry or phytochemistry. Lecture, three credits; laboratory, two credits. Ar.; 206PP. Mr. Harvey and assistants.
- 161w. Transport, Storage, and Ripening of Fruits and Vegetables. The effects of temperature, respiration, packing, etc., on storage life. Prerequisite: Plant Physiology, 3 credits. Three credits. Ar.; 206PP. Mr. Harvey.
- 162w. Physiological Relations of Crop Plants to Temperature. A graduate course covering in detail hardiness and general temperature effects. Readings and translations. Prerequisite: Physics 23. Three credits. Ar.; 206PP. Mr. Harvey.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 250s. Research Methods in Applied Plant Physiology. Advanced research methods of analysis and physical measurements applied in Physiology. Laboratory and lecture. Three to five credits. Ar.; 206PP. Mr. Harvey.
- 251f-252w-253s. Seminar in Applied Plant Physiology. One credit. Th IX; 206PP. Mr. Harvey.
- 254f-255w-256s-257su. Research Problems in Applied Plant Physiology. Special assignment of work in applied plant physiology. Mr. Harvey.
- 258f-259w. Growth Factors in Crop Plants. A lecture and reading course covering genetic physiology, the initiation of growth, growth rate, and effect of the environment on growth. Prerequisite: cytology and genetics. Two credits per quarter. Ar.; 212H. Mr. Harvey.

POLITICAL SCIENCE

Professors William Anderson, Oliver P. Field, Morris B. Lambie, Harold S. Quigley, Jeremiah S. Young; Assistant Professor Lennox A. Mills.

Prerequisites.—For major work, 18 credits; for minor work, 13 credits.

NOTE.—All candidates for postgraduate degrees are required to take Course 176-177, Scope and Methods of Political Science.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w.† Constitutional Law. I. Constitutional amendment; national-state relations; national judiciary; powers of Congress; taxation; interstate commerce. II. The executive; foreign relations; military affairs; territories; interstate relations. MWF VI; 221Bu. Mr. Field.
- 103s. Constitutional Law. III. Government and the individual; freedom of speech; ex post facto laws; obligation of contracts; due process of law; equal protection of laws. MWF VI; 221Bu. Mr. Field.
- 104f. American Constitutional Development. I. To 1800. Colonial origins; first state constitutions; formation of the federal constitution; organization of the new government. MWF II; 221Bu. Mr. Young.
- 105w. American Constitutional Development. II. 1800 to 1865. Political revolution of 1800; national sovereignty and state rights; slavery and the constitution; Civil War problems. MWF II; 221Bu. Mr. Young.
- 106s. American Constitutional Development. III. 1865 to the present. Reconstruction of the Union; extension of national authority over commerce, transportation, and labor; national subsidies to the states; structural and functional changes in government; government of dependencies; extension of democracy; recent amendments, including prohibition of the liquor traffic. MWF II; 221Bu. Mr. Young.
- 107f. Recent Social Legislation. Governmental powers and methods used for social legislation, state and national; peace and security; safety and health; public morals; semi-social economic relations; social insurance; minimum wage; city planning; police power restrictions on the use of private property. TThS II; 221Bu. Mr. Young.
- 108w. Legislative Power and Methods. Source and scope of the legislative power; methods used by legislative bodies; current legislative problems; formation and defense of legislative bills. TThS II; 221Bu. Mr. Young.
- 109s. Government and Business. Governmental powers; restraint of trade and manipulation of prices; protection of debtors; business affected with a public interest; combinations of laborers; corporations; compulsory benefits; conservation of natural resources; vested rights; confiscatory legislation. TThS II; 221Bu. Mr. Young.
111. Law of Public Utilities. See announcement of Law School.
- 113f-114w.† Administrative Law. I. Election, appointment, status, compensation, and discharge of civil officers and employees of government. II. Official powers; construction of powers; discretion; en-

- forcement of administrative orders; judicial remedies against abuse of official authority. TThS I; 221Bu. Mr. Field.
- 115s. Topics in Constitutional and Administrative Law. Study of a few related topics in these fields each year. TThS I; 221Bu. Mr. Field.
- 116s. Municipal Powers and Functions. Constitutional status, common law attributes, creation, alteration, and dissolution of cities, villages, and other municipal corporations; municipal officers, organization, and procedure; changing scope of the powers and functions of municipalities. MWF I; 111Bu. Mr. Anderson.
- 117f. Municipal Administration. Administrative organization, personnel, and financial problems of cities; city planning, public works, parks, police and fire departments, etc.; administration and regulation of local public utilities. TThS III; 111Bu. Mr. Anderson.
119. Jurisprudence. See announcement of Law School.
- 131f-132w.† Principles of Public Administration. Sources of administrative power; administrative areas and organization; the budget; purchasing; public service as a career. MWF II; 111Bu. Mr. Lambie.
- 133s. Problems of Public Administration. Special problems relating to finance, education, safety, health, welfare, commerce, labor, and conservation of natural resources. MWF II; 111Bu. Mr. Lambie.
- 145f-146w.† Comparative Government and Politics. Intensive study of parties, politics, and governmental processes in Great Britain, France, and other leading states. TThS III; 209Bu. Mr. Starr.
- 149-150.† Government and Politics of the British Empire. The imperial relationship; status and government of the self-governing dominions, the crown colonies, and India.
151. Topics in British Empire. Intensive study of some phase of British imperial affairs.
- 153-154. Far Eastern Government and Politics. The constitutional development of Japan and China; government, parties, and political problems. The first quarter is devoted to Japan, the second to China.
- 161w-162s.† Current Political Thought. Present day schools of political thought compared; ideas concerning sovereignty and liberty, state functions, representative government, and democracy; analysis of socialism, communism, syndicalism, and fascism. MWF III; 111Bu. Mr. Anderson.
163. Topics in Current Political Thought. Stress to be laid on current American political ideas.
- 165w. Development of Political Thought. See Philosophy 129. MWThFS I; 322F. Mr. Wilde.
169. Problems of Democracy. Problems of individual and class differences; public opinion; dictatorship; expert knowledge; and leadership.
171. Political Psychology. See Psychology 141.
- 175s. Political Parties. The nature, functions, organization, and methods of political parties, and other groups active in politics; legal control of parties and elections; public opinion as a factor in popular government. TThS; III; 111Bu. Mr. Starr.

- 176f-177w.† Scope and Methods of Political Science. The field of political science; relation to other studies; types of approach; research methods and technique; bibliography. Problems of teaching at the college level. Required of all candidates for postgraduate degrees in political science. Th 3:30-5:00; 221Bu. Mr. Anderson.
- 181f-182w. International Law. Nature, sources, and sanctions of international law. The laws of peace, war, and neutrality. MWF IV; 209Bu. Mr. Quigley.
- 183s. International Organization. The structure of the older international community and of the League of Nations; procedure in the formation of international policy; international legislation and administration; the settlement of international disputes; sanctions. MWF IV; 209Bu. Mr. Quigley.
- 184s. Problems in International Law. Intensive study of selected international controversies, varying from year to year, in the reports of national and international tribunals, and other source materials. WF 3:30-5:00; 312Lib. Mr. Quigley.
- 191f-192w.† Far Eastern Diplomacy. The international relations of China from the earliest period; early contacts between Japan and China; the policy of exclusion gradually overcome by western powers; the opening of the Far East in the nineteenth century; the "open door" policy; the Great War and the revision of treaties; the present situation. MWF VII; 209Bu. Mr. Quigley.
193. Problems of the Pacific. Intensive study of selected problems in the political and constitutional developments, or in the foreign relations, of Far Eastern countries.
- 195f-196w.† Colonial Government and Administration. The economic and political factors in colonization; forms of government; administrative organization, personnel, and problems; commercial policies; mandates under the League of Nations. MWF VI; 111Bu. Mr. Mills.
- 197s. Problems in Colonial Administration. MWF VI; 111Bu. Mr. Mills.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s.† Seminar in Public Law. Mr. Anderson, Mr. Young, Mr. Field.
- 211f-212w-213s.† Seminar in Modern Government and Political Theory. Mr. Anderson, Mr. Mills, Mr. Starr.
- 221f-222w-223s.† Seminar in Local Government and Public Administration. Mr. Anderson, Mr. Lambie.
- 231f-232w-233s.† Seminar in International Law and Relations. Mr. Quigley, Mr. Mills.

POULTRY HUSBANDRY

Associate Professor Frederick B. Hutt.

Animal genetics may be elected as a field for major or minor study in this division. With the approval of the adviser certain courses in plant

genetics, biometry, zoology, biochemistry, and in other fields of biology may be taken as part of the work in animal genetics.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101w. Advanced Poultry Breeding. Genetics of the fowl and principles of genetics applied to poultry breeding, fecundity, sex and secondary sex characters, physiology of reproduction. Prerequisite: Plant Genetics 131 or equiv. Three credits. Ar. Mr. Hutt.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f,w,s,su. Research in Animal Genetics. Special problems (other than the student's thesis) in animal genetics and in the physiology of reproduction. Two to five credits. Mr. Hutt.
- 202f. Animal Genetics. Assigned readings and lectures dealing with the genetics of domestic animals, laboratory animals, and man, also with special phases of animal genetics. Prerequisite: Plant Genetics 245. Three credits. Ar. Mr. Hutt.
- 203f,s. Seminar in Animal Genetics. Review of current literature and discussion of special topics. One credit per quarter. Ar. Mr. Hutt.
- 204w. Seminar in Poultry Husbandry. Review of important investigations in the biology of the fowl. One credit per quarter. Ar. Mr. Hutt.

PSYCHOLOGY

Professors Richard M. Elliott, John E. Anderson, Donald G. Paterson; Associate Professors Charles Bird, Edna F. Heidbreder; Assistant Professors William T. Heron, Kate Hevner, Miles A. Tinker.

Prerequisites.—For either major or minor work, 12 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w†-103s. Experimental Psychology. The theory and technique of the leading methods of experimental investigation in human psychology. Individual research problems in the second and third quarters. One lecture, four laboratory hours per week. Six or 9 credits. MWF VII, WF VIII; 116Psy. Mr. Tinker.
- 108f. Systems of Psychology. A comparative study of the problems, methods; and viewpoints of modern psychology. Three credits. TThS III; 115Psy. Miss Heidbreder.
- 114w-115s.† Human Behavior. An analysis of the development and organization of human behavior. Consciousness or mind, as a property of the living body, is discussed in its dependence upon response. Six credits. TThS II; 115Psy. Mr. Elliott.
- 125f-126w†-127s. Psychology of Individual Differences. Experimental and statistical study. Influence of sex, race, immediate ancestry, environment, maturity in the causation of individual differences. Investigation of definite problems and analysis of results. Individual research prob-

- lems in third quarter. Six or 9 credits. MWF II; 115Psy. Mr. Paterson.
- 130s. Vocational Psychology. Psychology of individual differences in intelligence, aptitudes, interests, and training, with special reference to vocational guidance. Two credits. F IX-X; 301F. Mr. Paterson.
- 140w. Social Psychology. A critical study of the experimental investigations of group behavior including the social significance of instinct, habit, imitation, suggestibility, and personality traits. Three credits. TThS III; 115Psy. Mr. Bird.
- 141s. Political Psychology. A biological and psychological approach to political theories and problems. The political significance of individual differences in intellect and temperament in relation to belief, propaganda, and public opinion. Three credits. TThS III; 115Psy. Mr. Bird.
- 144f-145w.† Abnormal Psychology. Normal and abnormal behavior contrasted. Varieties of maladjustment as illustrated in criminality, deficiency, fanaticism, and insanity. Stress will be laid on the inadequacies of personality as shown in everyday life. Six credits. MWF IV; ar. Miss Heidbreder.
- 151f-152w†-153s. Animal Psychology. Vertebrate behavior is emphasized. A critical study of the literature, and of the relationship between animal and human psychology. Individual investigation of special problems in the second and third quarters. Six or 9 credits. MWF VI; ar. Mr. Heron.
- 160f. Personnel Psychology. Psychology as applied to the selection and retention of a stabilized personnel. The standardized interview; principles and technique of employment tests; methods of judging character qualities; the rating scale; personnel classification methods. MWF VI; 115Psy. Mr. Longstaff.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f-201w-202s.† History of Psychology I. Origin and development of scientific psychology. Men, schools, and methods. Emphasis on the experimental period, 1860 to the present. Open to advanced students with permission of instructor. One credit per quarter. S I; 116Psy. Mr. Tinker.
- 203f-204w-205s.† History of Psychology II. Psychology in America. Development of laboratories, departments, apparatus, texts, and journals. Present status. Open to advanced students with permission of instructor. One credit per quarter. S I; 116Psy. Mr. Tinker.
- 206-207-208. Research in Animal Behavior. Mr. Heron.
- 210f-211w-212s. Research Problems. Laboratory investigations. Open to graduate students only. Mr. Elliott, Mr. Anderson, Mr. Paterson, Mr. Bird, Miss Heidbreder, Mr. Heron, Mr. Tinker.
- 215f-216w-217s.† Seminar in Psychology. Fortnightly meetings attended by teaching staff and advanced students for discussion of some of the fundamental problems of behavior and for reports of research in

- progress. Attendance of graduate students who are candidates for degrees is required. One credit per quarter. Alternate Thursdays 7:15-9:15 p.m.; 301Psy. Mr. Elliott.
- 220f-221w-222s.† Journal Club. Advanced students meet every other week for reports on current publications and discussion of contemporary trends in psychology and related sciences. Attendance of graduate students who are candidates for degrees is required. One credit per quarter. Alternate Thursdays 7:15-9:15 p.m.; 301Psy. Mr. Paterson.
230. Advanced Differential Psychology. Three credits. Ar. Mr. Paterson.
- 250f-251w-252s. Topics in Psychology. Independent reading and reports in any field of psychology, such as the psychology of sensation, reaction time, perception of space, Gestalt psychology, differential psychology, social and political behavior, personnel psychology, aesthetics, human and animal learning, etc., which meets the approval of one of the listed instructors. The chairman of the department will, if requested, assist the student in selecting the most appropriate instructor to guide reading in a particular field. Credits arranged. Mr. Elliott, Mr. Paterson, Mr. Bird, Miss Heibredér, Mr. Heron, Miss Hevner, Mr. Tinker.

ROMANCE LANGUAGES

Professors Everett W. Olmsted, Francis B. Barton, Irville C. LeCompte, Colbert Searles, Edward H. Sirich; Associate Professor Carlos V. Arjona; Assistant Professors Elizabeth Nissen, Raymond L. Grismer.

Prerequisites.—For major work, 27 senior college credits or equivalent; for minor work, 18 senior college credits or equivalent. Candidates for Master's degree must also have a reading knowledge of at least one other modern language. Candidates for the Doctor's degree must have had at least two years' work in Latin, and are required to take also the course in medieval Latin in the Latin Department. A reading knowledge of a second Romance language and of German is also required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

FRENCH

- 100s. French Oral Diction. Practical and theoretical study of spoken French. MTWF VIII; 203F. Miss Guinotte.
- 103f-104w-105s.† French Syntax and Composition. Special studies in characteristic problems of French syntax. F VI; 217F. Mr. Barton.
- 115f. French Literature: Seventeenth Century: Formation of the Classic Ideal. MTWF IV; 205F. Mr. Searles.
- 116w. French Literature: Seventeenth Century: Molière, Racine, LaFontaine. MTWF IV; 205F. Mr. Searles.
- 117s. French Literature: Seventeenth Century: Moral and Didactic Literature. MTWF IV; 205F. Mr. Searles.
- 118f-119w-120s. French Literature: Eighteenth Century. First quarter, beginnings of the philosophic movement, Bayle, Montesquieu, Diderot;

- second quarter, Voltaire; third quarter, Rousseau, the theater, the novel. TThS III; 217F. Mr. Sirich.
- 121f-122w-123s. French Literature: Sixteenth Century. First quarter, the Rhétoriciens, Marot, Rabelais; second quarter, the Pléiade; third quarter, Montaigne, Amyot. M VIII-IX, Th VII; 203F. Mr. Searles, Mr. Sirich. (Not offered in 1931-32.)
- 145w-146s. Explication de Textes. TTh VII; 203F. Mr. Boyer.
- 150f-151w-152s. French Dramatic Literature. A study of the development of dramatic literature in France from the classical period to the present time. TTh III; 203F. Mr. Olmsted.
- 153s. French Lyric Poetry. Contemporary French poets. MTWF VI; 217F. Mr. LeCompte.
- 157w. Modern French Novel: Bourget, Loti, France, etc. MTWTh VI; 217F. Mr. Boyer.
- 171f-172w-173s.† History of the French Language. Lectures and illustrative texts giving the development of the French language from its origins to the nineteenth century. Especially intended for prospective teachers. Th VIII; 203F. Mr. LeCompte.
- 174f-175w-176s. Contemporary French Novel and Drama. Lectures in French. TTh IX; 201F. Mr. Boyer.

SPANISH

- 110f-111w-112s. Spanish Literature: Nineteenth Century. MWF IV; 108F. Mr. Grismer.
- 115-116-117. Spanish Literature: Seventeenth Century. First quarter, the drama; second quarter, the novel; third quarter, lyric and epic poetry. Alternates with 156-157-158. Mr. Arjona. (Not offered in 1931-32.)
- 141s. Modern Spanish Novel. (Alternates with 150.) MTThF VII; 102F. (Not offered in 1931-32.)
150. Modern Spanish Drama. (Alternates with 141.) (Not offered in 1931-32.)
- 156f-157w-158s. Spanish Literature: Sixteenth Century. First quarter, the drama; second quarter, Cervantes and the novel; third quarter, poetry, the mystics. Alternates with 115-116-117. TThS II; 305F. Mr. Grismer.
- 174f-175w-176s. Lectures in Spanish: Twentieth Century Literature. First quarter, the drama; second quarter, the novel; third quarter, poetry. TTh IX; 202F. Mr. Arjona. (Not offered in 1931-32.)

ITALIAN

- 159f-160w. Dante. The *Divina Commedia*. (Alternates with 161-162.) MWF II; 217F. Miss Nissen.
- 161-162. The Sixteenth Century. Reading of texts and study of literary influences. Miss Nissen. (Not offered in 1931-32.)
- 164s. Dante (in English). Lectures, reading, and discussion of the *New Life*, and parts of the *Divine Comedy*. TThS II; 212F. Miss Nissen.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Old French Phonology and Morphology. Lectures on the origin and development of the French language, with practical exercises and reports on assigned topics. Six credits. F VIII, IX. Mr. LeCompte.
- 204f-205w-206s. Reading in Old French Literature. An introductory course in the reading of Old French. Different types of literature will be read and their origin and development discussed. A certain amount of collateral reading required. Three credits. F VII. Mr. LeCompte.
- 207f-208w-209s. Old Provençal. Reading in early Provençal literature with special attention to the poetry of the troubadours. Six credits. S III, IV. Mr. LeCompte.
- 222f-223w-224s. French Seminar. Six credits. W VIII, IX. Mr. Searles, Mr. Sirich.
- 230-231-232. Research Methods and Material. Three credits.
- 241f-242w-243s. Old Spanish Philology. Six credits. Mr. Olmsted.
- 244f-245w-246s. Old Spanish Literature. Every year a different genre is studied, such as the epic. Subject to be decided by agreement of students. Two credits.
- 250f-251w-252s. Spanish Seminar. Six credits.
- 259f-260w-261s. Research in Romance Languages. Credit depends upon amount of work accomplished.

SCANDINAVIAN

Professors Andrew A. Stomberg, Didrik A. Seip.

Prerequisites.—For major work, 18 credits; for minor work, 6 credits in the department. All required foreign language credits for the Master's degree in this department may be in either Danish, Norwegian, or Swedish.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Modern Norwegian Literature. From 1814 to the present day. Prerequisites: Scandinavian 1-2 and 3-4. Nine credits. TThS II; 110F.
- 104f. Modern Scandinavian History. Prerequisites: Scandinavian 4-5, 10-11-12, or 15 credits in history. Three credits. Knowledge of Scandinavian not required. MWF IV; 206F. Mr. Stomberg.
- 107f-108w-109s. Modern Swedish Literature. The Swedish novel. Prerequisites: Scandinavian 10-11. Nine credits. MWF V; 206F. Mr. Stomberg.
110. Ibsen. Prerequisites: Scandinavian 101-102-103. Three credits. Ar.; 110F.
- 111f-112w-113s. Old Norse (Icelandic). Grammar and reading. Six credits.
- 114f. Strindberg. Prerequisites: Scandinavian 107-108-109. Three credits. Ar. Mr. Stomberg.
- 117s. Earlier Norwegian Literature. Prerequisites: Scandinavian 4-5. Five credits. MTWFS III; 206F.

- 130f-131w-132s. Danish Literature of the Nineteenth Century. Nine credits.
- 134f-135w. The Landsmaal Movement.
- 136s. Björnson. Three credits. MWF II; 110F.
- 140f. History of the Norwegian Language and Literature. Prerequisites: Scandinavian 4-5 or 10-11 or equiv. Three credits. TThS II; 206F. Mr. Seip.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Seminar in the History of the Scandinavian Languages.
- 209f-210w-211s. Seminar in Modern Swedish Literature. Nine credits. Ar. Mr. Stomberg.
- 215f-216w-217s. Seminar in Norwegian Literature.
- 220f. Seminar in Ibsen. Prerequisite: consent of instructor. Three credits. Ar. Mr. Seip.

SOCIOLOGY AND SOCIAL WORK

Professors F. Stuart Chapin, Wilson D. Wallis (Anthropology), Malcolm M. Willey; Associate Professors Ross L. Finney, Clifford Kirkpatrick, Gertrude Vaile.

Prerequisites.—In sociology: for major work, 18 quarter credits; for minor work, 12 credits. In social work: elementary courses in general zoology, economics, political science, psychology, and sociology. In addition the following courses in sociology: Statistics, Elementary Case Work, Field Courses, and Social Protection of the Child.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f. Social Psychology. Primarily for sociology students. The social attitudes; their development and modification under social pressure; the interactions of individuals and groups. TThS II; 109J. Mr. Kirkpatrick.
- 101s. Social Organization. The organization and structure of social groups; the basic social processes of differentiation, stratification, and mobility. Integration and disintegration of social groups and institutions. Essential of social dynamics. MWF II; 110F. Mr. Chapin.
- 102s. Social Control and Criminal Behavior. A consideration of criminal behavior in relation to the breakdown of social control. MWF II; 109J. Mr. Vold.
- 103w. Sociology of Conflict. Types of social conflict and their rôle in social life. TThS II; 109J.
- 110f. Rural Organization. A study of social organization as it affects living conditions in small towns and rural districts. Especially designed for rural social workers and specialists in rural sociology or agricultural economics. MWF V; 104J.
- 112w. The Rural Social Survey. A course dealing with the methods and content of rural social research. All methods of investigation are

- analyzed. Especially designed for those interested in social research under Purnell or similar funds. MW V; 104J.
- 114s. Rural Social Institutions. A detailed study of the problems of organization and efficiency of selected rural institutions, especially religious, educational, civic, and recreational. For advanced students. Lectures, discussions, reports. MWF I; 105AgE.
- 115w. Religion As a Social Institution. The origin and function of religion viewed as a culture pattern in relation to social processes and social organization. MWF III. Mr. Kirkpatrick.
- 116w. The Newspaper As a Social Institution. A study of the social rôle of the newspaper in the United States, with special reference to the social changes that have influenced the press, and the corresponding influences of the press upon social life. MWF IV; 104J. Mr. Willey.
- 119f. The Family. The evolution of the family; development of family unity or disunity; the rôles of the several members of the family; methods of investigation of the family. TThS III; 104J.
- 120f. Social Progress. A history of the theories of progress and a critique of the idea of progress. MWF II; 109J.
- 121f-122w. Advanced Statistical Methods. The analysis and interpretation of social data by application of the theory of errors, the theory of probability, the theory of sampling, partial correlation, and the analysis of time series. MWF VII; 109J.
- 123s. Methods of Social Investigation. The nature of scientific method; the problems of sociology; specific methods of investigation of social phenomena. MWF VIII; 109J.
- 126s. The Technique of Leadership in Group Work. An advanced course for prospective executives in settlements and program agencies. TThS I; 104J. Miss Mead.
- 128s. Principles of Administration Applied to Social Work. A technical study of methods of organizing charitable agencies, of financing them, and of making the public aware of their work. Lectures and practice work. Th VIII, IX; 109J. Mr. Bradley.
- 129w. Selected Problems in Social Case Work. A study of social case work practices as applied to selected problems. IV MWF; 20J. Mrs. Fenlason.
- 130s. Advanced Case Work. A study of some of the wider aspects of social case work. A consideration of the adaptation of other scientific knowledge to social case work and an analysis of processes and techniques of interviewing. MWF IV; 20J. Mrs. Fenlason.
- 131w. Rural Social Case Work. Primarily a course for students wishing to specialize in social work in the rural field. III MWF; 20J. Miss Vaile.
- 132s. Juvenile Courts and Probation. Primarily a course in probation practice work, but prefaced by lectures on the social and legal aspects of the juvenile courts and probation.

- 133f. Social Case Work in Health Problems. A course open only to students who are properly grounded in case work. S IV, Th IX; 109J. Miss Gardiner.
- 134s. Legal Protection of the Child. A study of the relation of law to child welfare. A survey of existing children's protective legislation, of its administration and its future development. MWF I; 109F. Mr. Waite.
- 135f,w,s.* Field Practice in Legal Protection of the Child. Designed to meet the individual needs of students in the course on Legal Protection of the Child. Ar. Miss Vaile, Mrs. Fenlason.
- 136f. Essentials of Medicine for Social Workers. A discussion of diseases most often encountered in social work, with a consideration of their social implications. MWF IX; 20Ph. Miss Gardiner.
- 137w. The History and Theory of Social Work. A consideration of the historical backgrounds of the modern social work movement and the evolution of the theory underlying it. MWF I; 108F. Miss Salsberry.
- 138w-139s. Mental Case Work. A study of the intellectual and emotional factors in human adjustment and their significance in case work. TS II and ar.; 20Ph. Miss Leahy.
- 140w. History of Social Theory. A rapid survey of the leading social theories from the time of the Greeks with special reference to the more recent developments of sociology. The theories are related to their social backgrounds. MWF II; 109J. Mr. Wallis.
- 141s. Contemporary Social Theory. An intensive study of developments in the social theory of the late nineteenth and twentieth centuries. TThS II; 109J. Mr. Wallis.
- 152f. Public Welfare Administration. Deals with the history of public welfare administration and special problems of state and county administration of public welfare activities. TThS II; 20Ph. Miss Vaile.
- 153f,w,s-154f,w,s-155f,w,s.* Advanced Field Training in Group or Case Work. May be taken in specialized fields of child welfare and medical, as well as family, work. Ar. Miss Vaile, Mrs. Fenlason.
- 160s. Population Problems. MWF III; 9F. Mr. Chapin.
- 187f,w,s. Seminar in Educational Sociology. A discussion of the sociological foundations of educational theory, with investigation of special problems. M IX, X; 206Bu. Mr. Finney.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f-201w-202s. Seminar in Applied Sociology. Mr. Kirkpatrick.
- 203f-204w-205s. Seminar in Social Theory.
- 206f-207w-208s. Seminar: Statistical Theory in Relation to Social Theory and Practice. Mr. Chapin.
- 209f-210w-211s. Seminar: The Theory of Social Evolution: The Cultural Approach to Sociology. (Instructors in the introductory course are required to take this seminar in the fall quarter.) Mr. Willey.

* A fee of \$3.50 per quarter is charged for this course.

- 215f-216w-217s. Seminar in Rural Sociology.
- 218f-219w-220s. Seminar in Social Work. Miss Vaile, Miss Gardiner, Miss Leahy, Miss Mead.
- 221f-222w-223s.* Graduate Field Training. Twelve hours per weeks each semester.
- 224f-225w-226s. Medical Social Work. Principles and methods of medical social case work. Interrelations within medical institutions and with the community. The organization and development of social work in hospitals and dispensaries, its trends and scope. Open only to full time students who wish to specialize in medical social work. Three hours a week. Ar. Miss Gardiner.
- 227f-228w-229s.* Advanced Graduate Field Training. Twelve hours a week each quarter. Miss Vaile, Miss Gardiner.

SOILS

Professor Frederick J. Alway; Associate Professor Clayton O. Rost; Assistant Professors Paul R. McMiller, Constantine C. Nikiforoff.

Prerequisites.—For major work, at least two years of work in chemistry, including both quantitative analysis and organic chemistry, and one year of work in general physics. A reading knowledge of French or German is required for the Master's degree. In certain cases where some other modern foreign language would be more valuable in connection with the thesis it may be substituted.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Chemical Analysis of Soils. A laboratory course on the chemical examination of soils, including both fusion and extraction methods for mineral nutrients. Prerequisites: Soils 4 and 5 and quantitative analysis. Five credits. MWF 1:30-5:20; 103So. Mr. Rost.
- 102f,w,s. Special Problems in Soils. Individual laboratory or field work upon some special soil problem in soil physics, soil chemistry, or soil management. Arrangements must be made in advance. Prerequisites: Soils 4 and 5, and other courses according to problem selected. Three to five credits, according to work. 103So. Mr. Alway, Mr. Rost.
- 104s. Soil Surveying. Field practice in surveying soils and the preparation of soil maps. Prerequisites: Soils 4 and 5. Three credits. Mr. McMiller.
- 107w. Fertilizers and Manures. Sources, composition, and uses of the various fertilizers, manures, and soil amendments. Lectures and laboratory work. Prerequisites: Soils 4 and 5. Two credits. TS IV; 204So. Mr. Rost.
- 108w. Physical Properties of Soils. A laboratory course on the determination of physical constants of soils, including mechanical composition. Prerequisites: Soils 4 and 5. Three credits. TTh 1:30-5:20; 204So. Mr. McMiller.

* A fee of \$3.50 per quarter is charged for this course.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201w. Classification of Soils. Fundamental requirements of classification. Different systems of soil classification. Soil forming factors. Soil morphology, genesis, geography and cartography. Lectures and readings. Prerequisites: Soils 4, 5, 101, and 108. Three credits. TThS. Mr. Nikiforoff.
- 202f,w,s. Research in Soils. The investigation in the field, in the laboratory, or in both, of soil problems. The particular problem which a student may select will depend upon his previous training in agronomy, botany, chemistry, geology, and physics. Credit, according to work. Mr. Alway.
- 203w. Seminar in Soils. Review of current literature; presentation and discussion of papers on research; study of methods of investigation of soils. Required of graduate students. One credit. T VII; 204Ch. Mr. Alway.

SPEECH

Professor Frank M. Rarig.*

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w. Advanced Speech Composition. Structure and oral style. Psychology of persuasion. Briefing. Critical study of models. Written speeches. Reports. Prerequisites: Speech 41-42-43 or 45-46; Psy. 1-2; 10 credits in soc. sci. Six credits. Mr. Rarig.
- 105s. Theory of Reading and Acting. The forms of literature; literature regarded as an art; psychology of creative imagination; speech elements in literature; technique governing use of auditory and visual symbols. Collateral readings, speech problems, reports, term papers. Prerequisites: Speech 41-42-43 or 45-46; 81-82-83; Psy. 1-2. Three credits. MWF III; 308F. Mr. Rarig.
- 121f-122w.‡ Advanced Speech Problems. Factors determining the behavior of speakers and audiences. Prerequisites: Speech 41-42-43 or 45-46; Psy. 1-2. Recommended: Psy. 114-115; Anat. 4. Six credits. TThS III; 409F. Mr. Holmes.
- 141f-142w-143s.‡ Voice Science. The study of the voice mechanism and of vocal sound; methods of analysis and synthesis. The study of hearing. Experimental methods applied in individual research projects. Readings, reports, experiments. Prerequisites: Speech 41-42-43 or 45-46; Psy. 1-2; 4-5 or 7. Nine credits. Mr. Holmes.
- 162w-163s.‡ Speech Pathology. The physiological and psychological aspects of organic and functional speech problems. Theories of stuttering. Diagnoses, case histories, and treatment of speech cases. Observation of clinical diagnosis and treatment. Prerequisites: Speech 41-42-43 or 45-46; 61; 67; Psy. 1-2. Six credits. Hrs. ar. Mr. Bryngelson.

* Mr. Rarig will act as adviser for all graduate students in speech.

‡ A fee of \$1 per quarter is charged for this course.

THE GRADUATE SCHOOL

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 207f-208w-209s. Seminar in Orators. A critical study of the great English and American orators. One historical period each quarter. Prerequisites: Speech 41-42-43 or 45-46; 101-102; Psy. 1-2; 140; 10 cred. in soc. sci. Six credits. Hrs. ar. Mr. Rarig.
- 261f-262w-263s. Seminar in Speech Correction. A study and critical analysis of current literature in the field of speech pathology. Thesis problems. New theories and clinical procedures. Specific cases for group study. Prerequisites: Speech 41-42-43 or 45-46; 61; 67; 121-122; 162-163; Psy. 1-2. Six credits. Hrs. ar. Mr. Bryngelson.
- 291f-292w-293s. Research and Thesis. Open to graduate students who are engaged in thesis projects. Six credits. Mr. Rarig, Mr. Bryngelson, Mr. Holmes.

SURGERY

(Including divisions of General Surgery, Experimental Surgery, Orthopedic Surgery, Urology, and Dental Surgery)

For staff and courses of study offered, see special bulletin of graduate work in medicine.

VETERINARY MEDICINE

Professor Clifford P. Fitch.

Prerequisites.—For major work, 12 credits; for minor work, 6 credits in the department.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101w-102s. Advanced Anatomy of Domestic Animals. Advanced study of the structures involved in the type, conformation, and nutrition of the common farm animals. Dissection of farm animals, including a study of the osseous, muscular, and other principal anatomical structures. Mr. Kernkamp.
- 103f-104w. Advanced Comparative Physiology. An advanced course in physiology of the domestic animals, including laboratory work with special emphasis on animal nutrition. Mr. Hewitt.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 205f-206w-207s-208su. Veterinary Pathology and Bacteriology. Advanced problems. Specially adapted to meet the needs of graduate students. Offered as major or minor work. Credits ar. Mr. Fitch.

ZOOLOGY

Professors Dwight E. Minnich, William A. Riley,* Charles P. Sigerfoos. Jerry E. Wodsedalek; Associate Professor Adolph R. Ringoen; Assistant Professors Ralph W. Dawson, Samuel Eddy, and Clarence E. Mickel.

* Absent on leave, 1931-32.

Prerequisites.—For major work, Courses 1-2, 3-4, and at least 18 credits of advanced work approved by the department; for minor work, Courses 1-2, 3-4, or the equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 107f-108w.† Protozoology. Lectures, references, and laboratory work on the structure and life histories of Protozoa. Six credits. TThS I, II; 211,213Z. Mr. Sigerfoos.
- 109f-110w-111s. Experimental Zoology. A survey of animal behavior from the physiological viewpoint. Lectures, laboratory, reading. Nine credits. MWF IV; 211Z. Mr. Minnich.
- 117f-118w-119s.† Animal Ecology. Ecology of animals with special reference to insects. Lectures, laboratory, assigned reading and field work. Nine credits. TTh VI, VII, VIII; 401Z. Mr. Eddy, Mr. Hodson.
- 125f-126w-127s.† Advanced Entomology. Morphology and classification of insects, with lectures on the history of entomology. Nine credits. Ar.; 208Z. Mr. Mickel.
- 144f,s-145w-146s. Animal Parasites and Parasitism. Lectures and laboratory work. Origin and biological significance of parasitism; the structure, life history, and economic relations of representative parasites. Second term devoted primarily to the relation of insects to diseases of man and animals. Nine credits. WF VI, VII, VIII; 208Z. Mr. Riley.
- 148f-149w-150s. Histology and Organology. Comparative study of the microscopic structure of tissues and organs. Textbook, lectures, laboratory. Nine credits. MWF III, IV; 211,201Z. Mr. Ringoen.
- 160f-161w. Cytology. A survey of cell structure and behavior with special reference to genetic cytology. Lectures, reading, and laboratory work. Mr. Wodsedalek.
- 181w-182s. Comparative Embryology. A survey of the principles of animal development dealing with fundamental invertebrate and vertebrate types. Lectures, reference and laboratory work. Six credits. TTh VI, VII, VIII; 201Z. Mr. Ringoen.
183. Genetics and Eugenics. Facts and theories of heredity and the application of the laws governing natural inheritance for the improvement of the race. Three credits. TThS III; 313Z. Mr. Wodsedalek.
- 197f-198w-199s. Problems. Advanced work in some special line. Nine or 18 credits. Hrs. and days ar. Mr. Minnich, Mr. Riley, Mr. Sigerfoos, Mr. Wodsedalek, Mr. Ringoen, Mr. Eddy, Mr. Mickel.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-203. Research in Entomology. Hrs. and days. ar. Mr. Riley.
- 205-207, 209-211, 265-267. See Entomology and Economic Zoology.
- 211-213. Research in Ecology. Mr. Eddy.
- 217-219. Experimental Zoology. Mr. Minnich.
- 229-231. Research in Animal Histology. Mr. Ringoen.
- 233-235. Research in Embryology. Mr. Ringoen.
- 237-239. Research in Animal Cytology. Mr. Wodsedalek.
- 261-263. Research in Animal Parasitology. Mr. Riley.

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