# Bulletin of The University of Minnesota

# THE COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

## 1916-1917

VOL. XIX, NO. 4, AUGUST 1916

Entered at the Post-Office
in Minneapolis as second-class matter
Minneapolis, Minn.

The Bulletin of the University of Minnesota is issued as often as twice a month during the university year.

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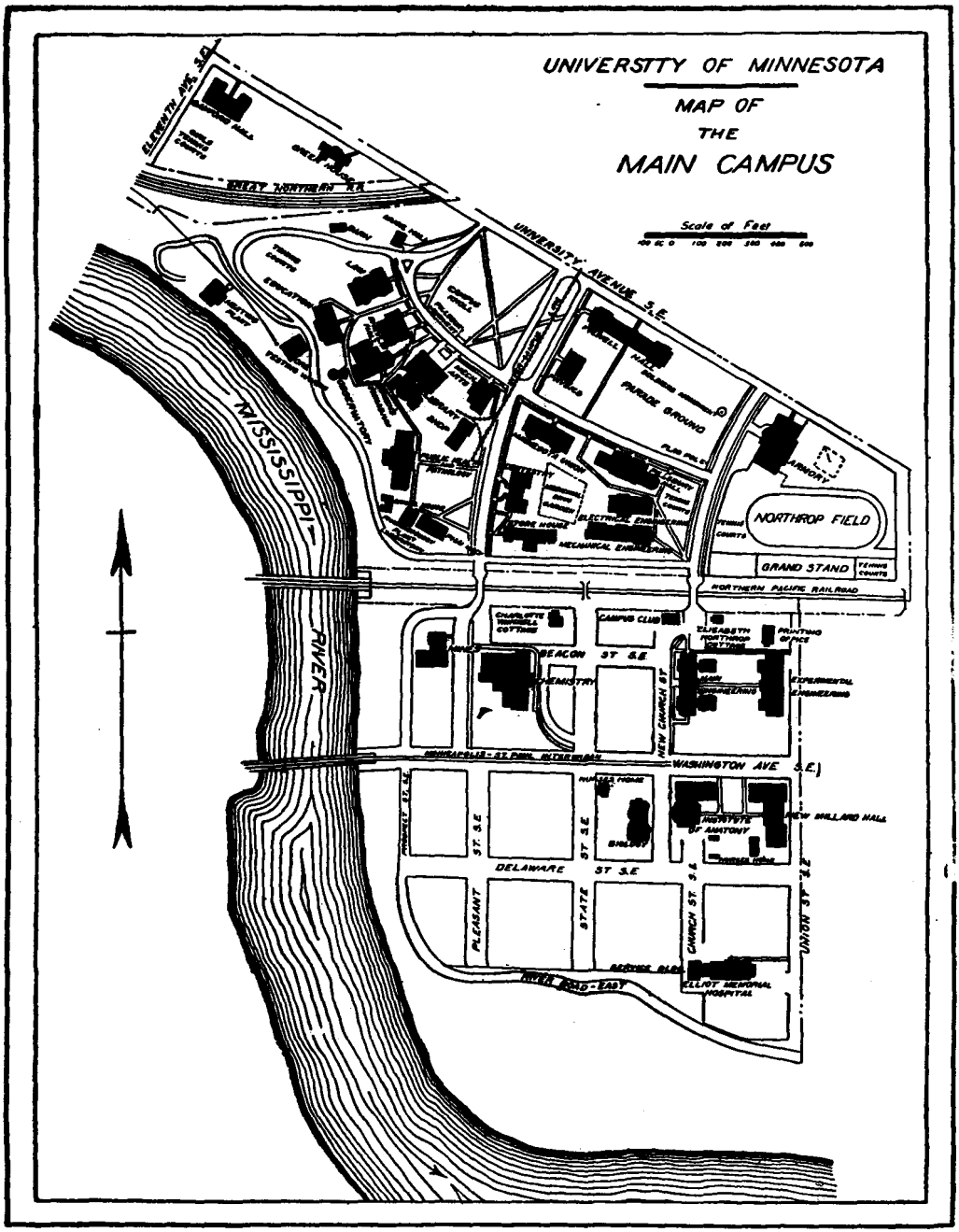
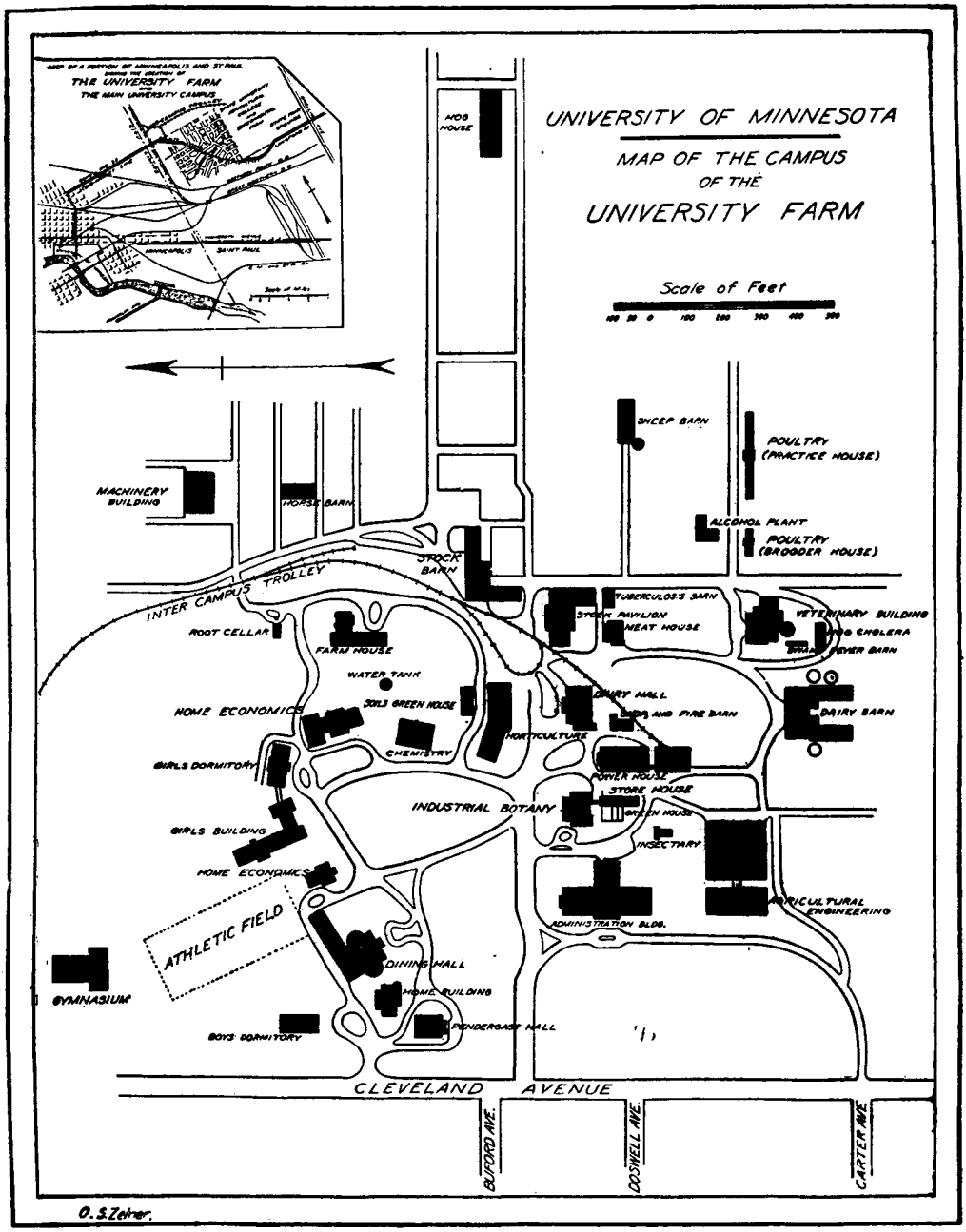



Area of Main Campus, 108.5 acres




Area of University Farm, 422.56 acres

## 1916

### JULY

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## 1917

### JANUARY

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### JULY

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### AUGUST

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |

| | | | |
|---|---|---|---|
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

### *Program of Entrance Examinations 1916-1917*

Entrance examinations for admission to the various colleges of the University will be conducted according to the following schedule, in Room 112, Library Building, unless otherwise specified.

Any student finding a conflict in his program should report to the Registrar for adjustment.

| | | | |
|---|---|---|---|
| Tuesday, | Sept. 19 | 9 a.m. | Business Subjects, Elementary Algebra, Plane Geometry |
| | | 2 p.m. | Manual Subjects, Domestic Art and Science, Agriculture, Higher Algebra, Solid Geometry |
| Wednesday, | Sept. 20 | 9 a.m. | Astronomy, Botany, Geology, Chemistry, Physiography, Zoology, Physics, Physiology |
| | | 2 p.m. | American Government, History, Economics, Commercial Geography, History of Commerce, Economic History of England, Economic History of the United States |

| | | | |
|---|---|---|---|
| Thursday, | Sept. 21 | 9 a.m. | English |
| | | 2 p.m. | German, Greek, French, Latin, Scandinavian, Spanish |

*Condition Examinations*

Regular examinations for the removal of conditions are given at no other times than (1) the week following the Easter recess, (2) the registration week in September.

The examinations in second-semester courses are given in the September period and those in first-semester courses are given after the Easter recess. No student may take more than one examination to remove a condition.

Examination schedules for the respective schools and colleges may be secured at the Registrar's office.

# COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

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* Absent on leave 1916-17.

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977 14th Ave. S. E.
CLARA WILLIAMS, Instructor in Voice 1810 11th Ave. S.
EDWIN H. ZEYDEL, M.A., Instructor in German

## ASSISTANTS AND SCHOLARS

1916-1917

### ANIMAL BIOLOGY

EDNA G. DYAR, B.S., Assistant
WALTER W. MARSHALL, M.A., Assistant
ADOLPH RINGOEN, M.A., Assistant
HELEN A. SANBORN, B.A., Assistant
EARL L. ABRAMSON, B.A., Teaching Fellow
ROYAL N. CHAPMAN, B.S., Teaching Fellow
HERBERT E. METCALF, B.S., Teaching Fellow

George H. Childs, M.A., Scholar
Emily Payne, B.A., Scholar
George A. Thiel, Helper

ASTRONOMY

Ralph Sylvester Underwood, B.A., Scholar

BOTANY

Donald Folsom, B.A., Assistant
Frances L. Long, B.A., Assistant
Harvey L. Stallard, Ph.B., Assistant
Vinnie A. Pease, B.A., Assistant
Arthur M. Johnson, B.A., Teaching Fellow

COMPARATIVE PHILOLOGY

Ralph Haefner, B.A., Scholar

ECONOMICS

J. E. Cummings, B.A., Assistant
Howard L. Hall, B.A., Scholar
Jackson B. Dennison, M.A., Scholar
Herbert Glenn Kenagy, B.A., Scholar
J. A. Nelson, B.A., Scholar

ENGLISH

Marie C. Lyle, M.A., Assistant
Aldena Carlson, B.A., Scholar
Ralph Colby, B.A., Scholar

GEOLOGY AND MINERALOGY

Myron A. Dresser, B.A., Scholar
Lloyd L. Stewart, M.S., Scholar

GERMAN

Arnold W. Shutter, M.A., Teaching Fellow
Louise G. Frary, M.A., Scholar
Dorothy J. Schaffnit, B.A., Scholar

HISTORY

Gladys Campbell, M.A., Assistant
Ruth Elizabeth Marshall, M.A., Teaching Fellow
Charles B. Kuhlman, B.A., Teaching Fellow
Alice M. Carr, B.A., Scholar

MARK M. HEALD, B.A., Scholar
DOROTHY HEINEMANN, B.A., Scholar
KARL H. TROUT, B.A., Scholar

MATHEMATICS

KARL HOLZINGER, B.A., Assistant
VERA WRIGHT, M.A., Assistant
ORVILLE A. GEORGE, B.A., Scholar

PHILOSOPHY AND PSYCHOLOGY

MABEL S. BRAUER, B.A., Scholar

PHYSICAL TRAINING FOR MEN

B. M. OHNSTAD, Assistant
HUBERT FOURNIER, Attendant
MORRIS H. LITMAN, Student Assistant

PHYSICAL TRAINING FOR WOMEN

LILLIAN HANSEN, Assistant

PHYSICS

FRITJOF VIK, B.A., Scholar
OSWALD ROGNLEY, B.A., Scholar

POLITICAL SCIENCE

PERCIVAL VIESSELMAN, M.A., LL.B., Assistant
MAX P. RAPACZ, B.A., Scholar
JOSEPH D. SULLIVAN, B.A., Scholar

RHETORIC AND PUBLIC SPEAKING

RAY M. WILCOX, Assistant
MARJORIE MORTLAND, B.A., Theme Clerk

ROMANCE LANGUAGES

GEORGE S. BARNUM, M.A., Teaching Fellow
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HERBERT CLEFTON, Student Helper

SCANDINAVIAN

DAGNEY E. NISSEN, B.A., Scholar

SOCIOLOGY AND ANTHROPOLOGY

CLYDE RAY CHAMBERS, B.A., Scholar

## FACULTY COMMITTEES

*Advisory Committee*

CEPHAS D. ALLIN
WILLIAM H. BUSSEY
WILLIAM H. EMMONS
AUGUST C. KREY
GEORGE N. NORTHROP
JOSEPH B. PIKE
COLBERT SEARLES
CHARLES P. SIGERFOOS

*Administrative Board*

EDWARD E. NICHOLSON, Assistant Dean
MARGARET SWEENEY, Dean of Women
LOTUS D. COFFMAN, Dean of the College of Education
ROYAL R. SHUMWAY
ALFRED E. KOENIG

# GENERAL INFORMATION

## ADMISSION

Admission is either by certificate or by examination. Candidates must have completed the equivalent of a four-year high school course and must present:

1. Four units of English; or three units of English and four units of a foreign language; or three units of English and two units in each of two foreign languages.
2. One unit of Algebra and one unit of Plane Geometry.
3. Enough additional work to make in all fifteen units, of which not more than four may be in vocational subjects.

A detailed statement of admission requirements may be found in the Bulletin of General Information.

Attention is called to the following new rule regarding advanced standing:

Credits of advanced standing are to be provisional and finally adjusted upon the following basis: Any student who, after one year's residence, has conditions or failures in at least six hours work shall lose all advanced credit except in those courses which have been continued in this college with a grade of at least C. Credits forfeited in this way can be secured only by special examination.

## CLASS ROUTINE AND SCHOLASTIC REQUIREMENTS

Classes are held every week day except Saturday afternoon. Recitation periods are fifty minutes long and begin at eight, nine, ten, eleven, one, two, three, four and five o'clock. A general assembly of faculty and students is held at noon on days to be announced.

Most of the courses of instruction are given in three periods a week on alternate days. Students are advised to arrange their programs so as to secure as even a distribution of classes as possible.

Examinations are held at the close of each semester. A student's grade is based upon his class work and examinations. Four grades, A. B, C, and D, are given for work done satisfactorily. Work not done satisfactorily is marked E (condition), or F (failure). Work of a satisfactory character but not finished is marked I (incomplete). An "incomplete" must be removed within one month after the opening of the following semester; otherwise it becomes a "condition." A "condition," if not removed before the opening of the corresponding semester of the following year becomes a "failure." A "failure" must be removed by pursuing the work again in class the next time the course is offered.

Students whose absences exceed four weeks in the aggregate during a semester are not permitted to take the semester examinations without

permission of the Administrative Board. Any student reported below grade in sixty per cent of his work, or in three subjects, at the middle or close of the first semester or middle of the second semester is dropped from the rolls and not allowed to re-enter the University until one full semester has elapsed.

Requirements for graduation are expressed in credit hours, indicating amount of work; and in honor points, indicating grade of work. Each credit hour demands on the average three hours a week of the student's time; that is, one recitation with two hours of preparation, or three hours of laboratory work. Honor points are computed as follows: each credit hour with the grade of A carries three honor points; each credit hour with the grade of B, two honor points; each credit hour with the grade of C, one honor point.

# COURSES OF STUDY

A student may, while registered in the College of Science, Literature, and the Arts, pursue one of the following courses:

*Courses given within this College:*

A general course leading to the degree of Bachelor of Arts.

An intensive course leading to the degree of Bachelor of Arts with Honors.

A four-year course leading to the degree of Bachelor of Arts in Music.

A four-year course in Business Education leading to the degree of B.A.

*Combined arts and professional courses:*

A six-year course leading to the degrees of Bachelor of Arts and Bachelor of Laws.

A five-year course leading to the degrees of Bachelor of Arts and Bachelor of Science in Chemistry.

An eight-year course leading to the degrees of Bachelor of Arts and Doctor of Medicine.

A seven-year course leading to the degrees of Bachelor of Science and Doctor of Medicine.

A six-year course leading to the degrees of Bachelor of Arts and Doctor of Dental Surgery.

### REGULATIONS APPLYING TO ALL COURSES

Military Drill is required of all freshman and sophomore men, and Physical Education of all freshman men and women.

Rhetoric 1-2 is required of all freshmen.

No student may elect work during any semester in more than five departments.

Students, except those in the third and fourth years of the Honors Course, must elect at least fourteen hours a week. Permission to take less than this number must be secured from the Administrative Board.

Students may ordinarily elect not more than seventeen credit hours. After the freshman year a student who has, during the preceding semester or two semesters, earned an average of one and one-half honor points for each credit hour taken and who has had no condition or failure the preceding semester, may elect eighteen hours.

## I. GENERAL COURSE LEADING TO THE DEGREE OF BACHELOR OF ARTS

The degree of Bachelor of Arts will be conferred by the College of Science, Literature, and the Arts, upon any student who fulfills all the requirements stated below.

## AMOUNT AND GRADE OF WORK

1. During his entire course the student must earn one hundred and twenty hours of credit and one hundred and twenty honor points.

2. A student must secure an average of one and one half honor points per credit hour in the courses which constitute his major.

3. No student may receive credit for more than two beginning modern language courses except by special permission.

4. At least thirty credits must be earned in residence at this college. If the term of residence is only one year, that year must be the senior year; and, in any case, at least half of the work of the senior year must be done in residence.

## DISTRIBUTION OF WORK

5. The subjects of the curriculum are divided into three distribution groups, as follows:

Group A. Rhetoric, English, Comparative Philology, Ancient and Modern Languages and Literatures, Music.

Group B. History, Economics, Political Science, Sociology and Anthropology, Education, Philosophy and Psychology.

Group C. Mathematics, Drawing and Descriptive Geometry, Home Economics, Animal Biology, Botany, Bacteriology, Human Anatomy, Human Physiology, Astronomy, Chemistry, Geology and Mineralogy, Physics.

6. Subjects open to freshmen are: Rhetoric, Ancient and Modern Languages, History, Mathematics, Home Economics, Animal Biology, Botany, and Chemistry. All freshmen must take Rhetoric 1-2.

7. Subjects for which freshmen register must be continued throughout the year.

8. Each student during his freshman year must elect work in at least two of the groups A, B, and C, and during his freshman and sophomore years must elect a total of two years' work in each of the three groups.

9. In Group C six credits in biological science (Animal Biology, Botany), and six credits in physical science (Astronomy, Chemistry, Geology and Mineralogy, and Physics), are required of all students. For this reason every student is advised to take one of these sciences in his freshman year.

10. Before the end of his sophomore year each student must choose a *major subject* and report his choice to the Registrar. The head of the department in which the student has made his selection will then assign him to an adviser.

11. The requirements for a major in any particular department are given in the departmental statement. In the distribution group to which his major subject belongs, known as the major group, the student must elect, subject to the approval of his adviser, at least forty-two credit hours. At least twelve of the forty-two credit hours must be outside of the major subject.

12. With the exception noted in paragraph 13, two *minor subjects* are requried, one in each of the two remaining distribution groups. The requirements for minors are given in the departmental statements.

13. In one of the minor groups the student must secure twenty-four credits, in the other eighteen credits. When Group C is the eighteen-credit group, a student who takes one year of mathematics is not required to secure a minor in this group.

14. During the junior and senior years each student must secure thirty credits in *starred courses*. With few exceptions these are courses open only to juniors and seniors. They are indicated in the departmental statements by an asterisk (*).

## ELECTION OF SUBJECTS IN OTHER COLLEGES OR SCHOOLS

Certain courses given in other colleges or schools of this University are open to junior and senior students of this college who have the specified prerequisites. Provided no duplication of subjects occurs, these courses may be taken on the same terms as courses given in this college and will count toward the B.A. degree. Such courses are listed at the end of the bulletin.

By resolution of the Board of Regents students in any college electing work in any other college must complete the work so elected before they are allowed to come up for the degree for which they are candidates.

## BACHELOR OF ARTS WITH DISTINCTION

This degree will not be given after 1917. Students of the classes of 1916 and 1917 may learn the requirements for this degree from their faculty advisers.

## THE UNIVERSITY STATE TEACHERS' CERTIFICATE

The University State Teachers' Certificate is granted to graduates of the College of Science, Literature, and the Arts who include the following prescribed work in their course, and who receive the recommendation of at least one department concerned with high school studies:

a. General Psychology ..... 6 credits
(Normally taken during the sophomore year)

b. Prescribed work in Education
This work must include all of the following courses except in the case of honor students

Practice Teaching ..... 3 credits
Teachers' Courses in two subjects, together carrying at least ..... 3 credits
Technique of Teaching..... 3 credits
History of Education..... 3 credits
Social Aspects of Education..... 3 credits

Honor students must take Psychology, Practice Teaching, Teachers' Courses, and at least one of the last three subjects named.

Part of this work must be taken in the junior year. The student must inform himself in advance so as to arrange his program properly.

### SPECIAL TRAINING COURSES FOR TEACHERS

Special attention is called to the opportunity for training in a number of specialized fields. The State of Minnesota has provided for special aid for teachers of defectives, for high school librarians, teachers of manual training, agriculture, home economics (domestic science), commercial branches, and for heads of high school departments for training rural teachers. Special courses for preparing teachers of agriculture and teachers of home economics will be found described in the College of Agriculture bulletin. For descriptions of courses preparing for the remaining lines, consult bulletin of the College of Education.

### SPECIAL COURSES FOR TWIN CITY TEACHERS

Arrangements have been made for offering courses in various departments at times which will make them readily available for teachers in the Twin Cities and environs. These courses will be scheduled to come Saturday mornings or week days after four p.m. For list of these courses, see special announcement issued by the College of Education. This announcement will be ready early in September.

## II. COURSE LEADING TO THE DEGREE OF BACHELOR OF ARTS WITH HONORS

The degree of Bachelor of Arts with Honors is given upon the completion of a specialized and intensive course of study.

Students who desire this degree are strongly advised to register for it and seek the advice of the major department as early in their course as possible. The election of the honors course must be made and the major subject chosen before the end of the sophomore year.

Students electing the honors course must present at the end of the sophomore year sixty credits and ninety honor points and must demonstrate to the major department their ability to use one or more foreign languages specified by the department.

The honors course requires 105 credits in class work and a satisfactory thesis in the major subject. The student must maintain an average standing of B in the major subject and also in the work of the junior and senior years, and must be recommended for graduation by the staff of the major department.

A student in good standing in the honors course may transfer to the general course, and a student who at any time falls below the standing required in the honors course will be transferred to the general course

by the Administrative Board. The conditions of the transfer in all cases are to be determined by the Board.

### OUTLINE OF COURSE

The requirements in the freshman and sophomore years are the same as for all students.

The requirements for the junior and senior years are as follows:

1. Major Subject

The student shall devote half his time during these two years to work defined by the major department and approved by the Advisory Committee. All such courses must rest on sophomore work as prerequisites. The departments shall provide for an advancing sequence in the student's work during the junior and senior years. At least one year (six credits) must consist of individual work in advanced courses whose object is to prepare the student for independent investigation. The thesis shall be prepared in connection with this work and under the direction of the instructor.

The thesis shall give evidence of ability to use successfully the laboratory and library materials and methods required in the subject and a thoro command of present knowledge on the topic selected.

2. Electives

In addition to the major the student shall complete enough elective courses to make a total of 105 credits. The student is advised to take from twenty-four to thirty hours in his junior year.

## III. FOUR-YEAR COURSE IN ARTS AND MUSIC, LEADING TO THE DEGREE OF BACHELOR OF ARTS IN MUSIC

The requirements for admission are the same as those for admission to the regular freshman class, together with one of the following requirements in Music, according to the instrument selected:

Pianoforte: Candidate must be able to play Czerny's *School of Velocity,* and the easier Haydn and Mozart Sonatas.

Violin: Candidate must be able to play the first ten of Kreutzer's *Forty Etudes,* and the easier Handel and Mozart Sonatas.

Violoncello, organ, and orchestral instruments. Candidate must pass entrance examinations equal to the above grade.

Voice: Candidate must possess good natural equipment, some previous vocal training, be a ready sight reader, and have a reading knowledge of the standard German and English songs.

The number of credits required for the degree in Music is one hundred and twenty, not counting Military Drill or Physical Education, which are required the same as for the B.A. degree; fifty-four to fifty-eight of the one hundred and twenty credits required must be in subjects other than Music. During the four years the student must earn one hundred and twenty honor points.

The number of credit hours a semester is the same as for the B.A. degree.

Not more than nine nor less than six credit hours may be elected aside from Music during any one semester.

Two one-half hour lessons, plus twelve to fifteen hours' practice a week for one semester, are required in order to gain four credits in applied Music.

### OUTLINE OF COURSE

*Freshman Year* (Sixteen or Seventeen Credits Each Semester).

1. Elect four credits from A, or four credits from B, including Voice.

| A | B |
|---|---|
| Piano (4) | Piano (2) |
| Violin (4) | Violin (2) |
| Cello (4) | Cello (2) |
| *Organ (4) | Voice (2) |

2. Harmony (3)
3. Rhetoric (3)
4. Beginning Modern Language (6) or two 3-hour courses if entrance credits are offered in two languages.
5. Orchestra (1) elective.

*Sophomore Year* (Sixteen or Seventeen Credits)

| A | B |
|---|---|
| 1. Piano (4) | Piano (2) |
| Violin (4) | Violin (2) |
| Cello (4) | Cello (2) |
| | Voice (2) |

2. Counterpoint (2)
3. Acoustics (3) First Semester. Experimental Psychology (3) Second Semester.
4. Modern Language (3)
5. History (3)
6. Ear Training (1)
7. Orchestra (1) elective.

*Junior Year* (Seventeen or Eighteen Credits)

| A | B |
|---|---|
| 1. Piano (4) | Piano (2) |
| Violin (4) | Violin (2) |
| Cello (4) | Cello (2) |
| | Voice (2) |

* Not offered during 1916-17.

2. English Survey (3)
3. History of Music (3)
4. Normal Piano (3) or Public School Music (3)
5. Elect four credits from A, including Appreciation of Music (for Public School Music students).

| A | |
|---|---|
| Ensemble (2) | Required Subjects for Public School Music Students |
| Appreciation of Music (1) | Technic of Teaching (3) |
| Musical Composition (2) | Appreciation of Music (1) |
| Analysis (1) | |

6. Orchestra (1) elective.

*Senior Year* (Twelve or Thirteen Credits)

| A | B |
|---|---|
| 1. Piano (4) | Piano (2) |
| Violin (4) | Violin (2) |
| Cello (4) | Cello (2) |
| | Voice (2) |

2. Bach and Beethoven (2) First Semester. Brahms and Wagner (2) Second Semester.
3. English Literature (3) or Modern Language (3); for Public School Music Students, Social Education (3) History of Education (3) required.
4. Normal Piano (3) or Public School Music (3).
5. Orchestra (1) elective.

## IV. FOUR-YEAR COURSE IN BUSINESS EDUCATION, LEADING TO THE DEGREE OF B.A.

This course differs from the general B.A. course in two ways. The student is able to give a larger part of his time to studies of especial value in preparation for business, and a somewhat higher grade of scholarship is required for advancement and graduation.

The sequence of studies has been determined by the aims of the course. It is the aim in the freshman and sophomore years to give a broad training in those subjects which furnish the foundation for the study of business processes; to acquaint the student with the relations of those processes to the social organization; and to provide the common tools needed in these studies and in the prosecution of business dealings.

It is the aim in the junior and senior years to provide instruction in such branches of economics, political science, law, etc., as give an adequate preparation for general business activities, and to offer in elective courses opportunity either for limited specialization in business lines or for such other work as the student desires.

*Language requirement.* Before beginning the work of the senior year the student must satisfy the language department concerned, by examina-

tion, that he can read readily business and economic literature in French, German, or Spanish. This examination, if taken earlier in the course or at the time of entrance, will relieve the student of further required courses in modern languages.

*Scholarship requirement.* In order to enter upon the work of the sophomore year in this course the student must have secured one honor point for each credit hour in the freshman year and have had no conditions or failures, or he must have secured one and one-half honor points for each credit hour. In the sophomore, junior, and senior years the student must secure one and one-half honor points for each credit hour carried.

FRESHMAN YEAR

| | Credits |
|---|---|
| Rhetoric 1-2 | 6 |
| Modern Language | 12 or 6 |
| Laboratory Science or Mathematics | 0 or 6 |
| History 3-4 (English History) | 6 |
| Physical Geography (Geology 37) | 3 |
| Industries and Commerce (Economics 2) | 3 |
| | 30 |

SOPHOMORE YEAR

| | Credits |
|---|---|
| Modern Language (continued for those who begin it in the University) | 6 |
| Laboratory Science or Mathematics (if not taken in freshman year) | 6 |
| Principles of Economics (Economics 7-8) | 6 |
| Principles of Accounting (Economics 35-36) | 6 |
| History (American or Modern European) | 6 |
| And the following subjects if the student's program permits: | |
| Political Science | 6 |
| Psychology | 3 |
| Elective | 3 |
| | 30 |

JUNIOR YEAR

| | Credits |
|---|---|
| The above courses in Political Science and Psychology if not taken in the sophomore year | 9 |
| English or Advanced Composition | 6 |
| Political Science | 6 |
| Economics | 6 |
| Electives | 3 or 12 |
| | 30 |

SENIOR YEAR

| | Credits |
|---|---|
| Political Science | 6 |
| Economics | 12 |
| Electives | 12 |
| | 30 |

Attention should be called to the fact that the term "Economics" as used in the above outline includes a wide range of business subjects (Business Management, Accounting, Marketing, Advertising, Insurance, Investment, etc.) which are taught in the Department of Economics. Also, the term "Electives" indicates that the student is free to spend this part of his time either in these business subjects or in any other work which the College offers.

The National City Bank of New York offers each year to students in this course one or more scholarships for the purpose of training young men in banking and foreign trade. These scholarships provide for expenses during certain periods of practical work and study in the National City Bank.

## V. OTHER VOCATIONAL COURSES

For information and advice regarding the selection of studies in preparation for various vocations, the student should consult the heads of departments concerned. Young women should consult Dean Sweeney. The studies offered by the college are so varied and the opportunities for election are so great that the student who first forms an intelligent plan can usually find an excellent combination and sequence of courses serving his particular purpose.

## COMBINED ARTS AND PROFESSIONAL COURSES

## VI. SIX-YEAR COURSE IN ARTS AND LAW, LEADING TO THE DEGREES OF BACHELOR OF ARTS AND BACHELOR OF LAWS

The work of the first three years of this course is done in the College of Science, Literature, and the Arts and is subject to the regulations which govern the work of other Arts students. During these three years the student must secure not less than ninety credits, including fifteen credits in starred courses. The first year of the course in the Law School counts as the equivalent of the fourth year (thirty credits) of the Arts course. During the four years the student must earn one hundred and twenty honor points.

## SHORTER PRE-LEGAL COURSES

While the faculty of the Law School strongly recommends the above course, two other courses are open to students who wish the degree of

Bachelor of Laws alone. They may take two years' work in the College of Science, Literature, and the Arts, under the regulations which govern other Arts students, or they may take the special pre-legal course outlined below. The student's registration blank must show which course is chosen and that course must be followed without variation. In either case the student must secure at least fifty-eight credits in order to be eligible for admission to the Law School.

In case any student after taking the special pre-legal course shall become a candidate for the B.A. degree, he must satisfy all the regular requirements for that degree.

Students who offer for entrance less than two units of natural science must take one year of natural science.

### FRESHMAN YEAR

| | Credits | |
|---|---|---|
| Rhetoric 1-2 | 6 | |
| Mathematics or Science | 6 (or 10) | |
| (1) The student must complete the equivalent of Mathematics 1 and 2, or 3 and 4. If he has had this he may elect 6 credits in science. | | |
| Language | 6 (or 12) | |
| (1) The student with two or more units of entrance credits in Latin is strongly advised to take Latin (6 credits). | | |
| (2) The student not taking Latin must take French or German. | | |
| History 3-4 | 6 | 6-18 |
| Economics 3-4 | 6 | |
| Political Science 1 | 3 | |
| Military Drill and Gymnasium, for men | | |
| | | 28-36 |

### SOPHOMORE YEAR

| | Credits | |
|---|---|---|
| Rhetoric 15-16 | 6 | |
| Language | 4-6 | |
| A continuation of the same language taken in the freshman year. | | |
| History 5-6 | | 6-18 |
| Economics: | | |
| 3-4 (if not previously taken), and not more than three of the following courses: 2, 5, 13, 18, 76, 35-36, 41, 43, 47 | | |
| Political Science: | | |
| Not less than one nor more than four of the following courses: 1 (if not previously taken), 3, 5, 6, 7, 9. | | |
| Military Drill, for men | | |
| | | 28-34 |

## VII. FIVE-YEAR COURSE IN ARTS AND CHEMISTRY, LEADING TO THE DEGREES OF BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN CHEMISTRY

During his first three years the student does his work in the College of Science, Literature, and the Arts subject to the regulations governing other Arts students, and must secure at least ninety credits, including fifteen credits in starred courses. This work must include:

a. Rhetoric 1-2 and twelve credits in German.
b. Eighteen credits in Group B (see page 22).
*c. The following courses:
General Chemistry and Qualitative Analysis, or equivalent.
Quantitative Analysis, one year.
Technical Drawing 21-22, one year.
Geology 21, one semester.
Metallurgy 2 (men) or Geology 22 (women), one semester.
Biological Science, one year.
General Physics with laboratory work, one year.
Mathematics, ten credits.
Glass Blowing, one credit.

The fourth year of the course is the same as the junior year of the Analytical Course of the School of Chemistry and counts as the equivalent of the fourth year (thirty credits) of the Arts course. During the four years the student must earn one hundred and twenty honor points.

### POST-SENIOR YEAR

The student's fifth year is the same as the fourth year of the Analytical Course of the School of Chemistry, and upon its completion he will be entitled to the degree of Bachelor of Science in Chemistry.

During the senior and post-senior years the student, if prepared, has the privilege of specializing for not less than two semesters along one of the following lines: Organic Chemistry, Physical Chemistry, Analytical Chemistry, Applied Chemistry, Photochemistry, Physiological Chemistry, Geochemistry, Bromatology.

## VIII. EIGHT-YEAR COURSE IN ARTS AND MEDICINE, LEADING TO THE DEGREES OF BACHELOR OF ARTS AND DOCTOR OF MEDICINE

During the first three years of this course the student does his work in the College of Science, Literature, and the Arts subject to the regulations governing other Arts students and must secure ninety credits including fifteen credits in starred courses. The first year of the course in the Medical School counts as the equivalent of the fourth year (thirty credits) of the Arts course. During the four years the student must earn one hundred and twenty honor points.

### FRESHMAN AND SOPHOMORE YEARS

The following subjects must be included:

Rhetoric 1-2, six credits.

Zoology 1-2, six credits.

Qualitative Analysis and Medical Organic Chemistry with the elementary courses prerequisite to them.

German sufficient to secure a reading knowledge, to be tested by a committee of the Medical faculty.

Physics, 1, 2, 3, and 4, eight credits. This work must be preceded by Mathematics 1 and 2, ten credits, or 3 and 4, six credits.

### JUNIOR YEAR

The work of the junior year is elective, subject to the requirement of fifteen credits in starred courses.

### SENIOR YEAR

This year is taken in the Medical School, and is counted toward the B.A. degree.

## IX. SEVEN-YEAR COURSE IN SCIENCE AND MEDICINE, LEADING TO THE DEGREES OF BACHELOR OF SCIENCE AND DOCTOR OF MEDICINE

To be eligible for admission to the Medical School, students in this course must secure in the College of Science, Literature, and the Arts not less than sixty credits including the subjects required during the freshman and sophomore years of the Eight-Year Course in Arts and Medicine.

### JUNIOR AND SENIOR YEARS

The work during these two years is taken in the Medical School, and is credited toward the B.S. degree. To secure this degree the student must have one hundred and twenty credits and one hundred and twenty honor points.

Students who have completed elsewhere two or more years of collegiate or university work which includes the required subjects specified above and which is in other respects the full equivalent of the two years of Academic work required in the seven-year combined course, will be awarded the degree of Bachelor of Science on recommendation of the Faculty of the College of Science, Literature, and the Arts, provided they meet the scholarship requirements stated above. The credit value of work done elsewhere shall be determined by the Administrative Board of the College of Science, Literature, and the Arts, but such credits shall not become effective until the student shall have completed, with the required standing, two full years of work in the Medical School of the University of Minnesota.

## X. SIX-YEAR COURSE IN ARTS AND DENTISTRY, LEADING TO THE DEGREES OF BACHELOR OF ARTS AND DOCTOR OF DENTAL SURGERY

During the first three years of this course the student does his work in the College of Science, Literature, and the Arts, subject to the regulations governing other Arts students and must secure ninety credits, including fifteen credits in starred courses. The final year of the course in the College of Dentistry counts as the equivalent of the fourth year (thirty credits) of the Arts course. During the four years the student must earn one hundred and twenty honor points.

# DEPARTMENTAL STATEMENTS

## EXPLANATION OF COURSE NUMBERS

Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. The suffixes *a* and *b* apply to one-semester courses offered both semesters, *a* indicating the first semester and *b* the second semester (e.g., 3a,b; 4a,b). Courses marked with a *t* are given at hours convenient for teachers.

All undergraduate courses are numbered from 1 to 100. All courses open to undergraduates and graduates are numbered from 101 to 200. Strictly graduate courses are numbered from 201 up.

## STARRED COURSES

Courses marked with an asterisk (*), called starred courses, are courses which are open only to juniors, seniors, and graduate students, and which have at least nine prerequisite credits if the department offers work in the freshman year, and at least six prerequisite credits if the department offers no work in the freshman year. It is provided, however, that courses in foreign languages for which there is a prerequisite of five years in secondary school and college, at least one year of which is in college, shall be starred courses.

*For graduation a student must secure during the junior and senior years thirty credits in starred courses.*

The following abbreviations are used: A, Armory; AB, Animal Biology; Ar indicates that the days, hours, or room are to be arranged (for information, apply to head of the department concerned); C, Chemistry Building; Ed, Education Building; En, Engineering Building, University Farm; F, Folwell Hall; G, Greenhouse; He, Home Economics Building, University Farm; L, Law Building; Lib, Library Building; MA, Mechanic Arts; ME, Main Engineering Building; Mech E, Mechanical Engineering Building; MH, Millard Hall; Mu, Music Building; O, Observatory; P, Pillsbury Hall; PH&P, Institute of Public Health and Pathology; Ph, Physics Building; WGm, Women's Gymnasium.

The symbol ¶ indicates that the instructor is to be assigned.

## ANIMAL BIOLOGY

Professors Henry Francis Nachtrieb, John B. Johnston, Thomas S. Roberts, Charles P. Sigerfoos; Associate Professor Hal Downey; Assistant Professors Elmer J. Lund, Oscar W. Oestlund; Instructors George Delvin Allen, Charles E. Johnson; Assistants Walter W. Marshall, Adolph Ringoen, Helen Sanborn; Teaching Fellows Earl L. Abramson, Royal N. Chapman, Herbert E. Metcalf.

## REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* freshman year, Course 1-2; sophomore year, the student may elect from Courses 7-8, 15-16, 19-20, 23-24; during the junior year the student must elect from Courses 31 to 144, and must include some line of work begun in the sophomore year which he expects to pursue during the senior year under 161-162.

*For a Teacher's Certificate* an average of one and one half honor points in Courses 1-2, 31-32, and six other credits in Animal Biology and six credits in Botany.

## JOURNAL CLUB

The professors, instructors and advanced students of the department meet once a week to review and discuss current zoological literature and to listen to reports from those carrying on investigations.

## COURSES

| No. | Credits | Title | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|
| 1-2 | 6 | **Gen. Zoology ..... | All | | None |
| | | Sec. 1. Lab. 8, 9 | WF | 101AB | ¶ |
| | | Lect. 10 | WF | 312AB | ¶ |
| | | Sec. 2. Lab. 10, 11 | WF | 101AB | ¶ |
| | | Lect. 9 | WF | 312AB | ¶ |
| | | Sec. 3. Lab. 1, 2 | M | 101AB | ¶ |
| | | Lab. 2, 3 | W | 101AB | ¶ |
| | | Lect. 1 | WF | 312AB | ¶ |
| | | Sec. 4. Lab. 8, 9 | ThS | 101AB | ¶ |
| | | Lect. 10 | ThS | 312AB | ¶ |
| | | Sec. 5. Lab. 10, 11 | ThS | 101AB | ¶ |
| | | Lect. 9 | ThS | 312AB | ¶ |
| | | Extra Lab. Classes | | | |
| | | Sec. 6. Lab. 8, 9 | MT | 101AB | ¶ |
| | | Sec. 7. Lab. 10, 11 | MT | 101AB | ¶ |
| 7-8 | 6† | Histology-Embryology .... | Soph., jr., sr. | | 1-2 |
| | | 10, 11 MWF | 201,211AB | Downey | |
| 12 | 3 | Histological Technique ... | Soph., jr., sr. | | 1-2 and 7-8 |
| | | See Anatomy Schedule. | | | |
| 15-16 | 6† | Gen. Physiology ..... | Jr., sr. | | 12 credits in Animal Biology or Zool. 1-2 and Chemist. 13-14 or 35-36 |
| | | 2, 3 MWF | 20AB | Lund | |
| 19-20 | 6† | Comp. Gross Anat. of Vert. | Soph., jr., sr. | | 1-2 |
| | | 2, 3 MWF | 105, 109, 211AB | Johnson | |
| 23-24 | 6† | Entomology ..... | Soph., jr., sr. | | 1-2 |
| | | 10, 11 MWF | 208, 210AB | Oestlund | |
| | | 8, 9 TThS | 208, 210AB | Oestlund | |
| 28 | 3 | Ornithology ..... | Soph., jr., sr. | | 1-2 |
| | | 2, 3, 4 TTh | 211, 314AB | Roberts | |
| 30 | 3 | Neurology ..... | Soph., jr., sr. | | 1-2 |
| | | Ar | 215IA | Johnston | |

| No. | Credits | Title | | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|---|
| *31-32 | 3† | Nature Study ..... | | | Jr., sr. | 12 credits in Animal Biology |
| | | 2, 3, 4 | T | | 213AB | Sigerfoos |
| *51 | 3‡ | Protozoology ..... | | | Jr., sr. | 9 credits inc. 1-2 |
| | | 8, 9 | TThS | | 213AB | Sigerfoos |
| *56 | 3‡ | Morphology of Invertebr.. | | | Jr., sr. | 9 credits inc. 1-2 |
| | | 8, 9 | TThS | | 213AB | Sigerfoos |
| *101-102 | 6 | Advanced Entomology .... | | | Jr., sr., grad. | 1-2, 23-24 |
| | | 2, 3 | MWF | 208, | 210AB | Oestlund, Chapman |
| *107-108 | 6 | Gen. Ecology of Insects... | | | Jr., sr., grad. | 1-2, 23-24 |
| | | 2, 3, 4 | TTh | 208, | 210AB | Oestlund, Chapman |
| *115-116 | 6 | Mammalogy ..... | | | Jr., sr., grad. | 1-2, 7-8 or 19-20 |
| | | 4, 5 | MWF | 107, 109, | 211AB | Johnson |
| *119-120 | 6 | Vertebrate Histology ..... | | | Sr., grad. | 1-2, 7-8, 12 |
| | | 3, 4 | TThS | 201, | 211AB | Downey |
| *123-124 | 6† | Blood of Vertebrates..... | | | Sr., grad. | 1-2, 7-8, 12, 137-138, reading knowledge of French and German |
| | | 3, 4 | TThS | 201, | 211AB | Downey |
| *131-132 | 6† | Embryology ..... | | | Jr., sr., grad. | 1-2, 7-8 |
| | | 10, 11 | MWF | 211, | 202AB | Nachtrieb |
| *143-144 | 6 | Genetics and Eugenics.... | | | Sr., grad. | 1-2, 7-8, or 131-132, 15-16 |
| | | 2, 3, 4 | TTh | 202, | 211AB | Nachtrieb |
| *161-162 | 6 or 12 | Problems ..... | | | Sr., grad. | 1-2 and other courses prescribed by department |
| | | Hours, days, and rooms arranged | | | | |

** So far as possible students should register for both lecture and laboratory work in the same section.

† Both semesters must be completed before credit is given for the first semester.

‡ Courses 51 and 56 may be combined for a year-course.

## INTRODUCTORY COURSES

1-2. General Zoology. A survey of the animal kingdom, emphasizing the principles of structure, physiology, embryology, classification, and evolution of animals. Textbook, lectures, and quizzes. Sigerfoos, Lund, Allen, Ringoen, Sanborn.

7-8. Histology and Embryology. A comparative microscopic study of the origin and structure of the tissues of vertebrates and invertebrates, and of the organs of mammals. Textbook, lectures, and laboratory. Downey and Assistant.

15-16. General Physiology. Characteristic properties of living substance shown by preparation and properties of biological compounds, colloids, enzyme action, growth, inanition; production of movement, heat, etc. Mechanism and conditions of excitation and response. Laboratory, lecture, readings, quizzes. Lund.

19-20. Comparative Gross Anatomy of Vertebrates. (a) Dissection and study of selected types, cyclostomes to reptiles or birds inclusive; special consideration of history of organ systems. (b) Mammalian anatomy. An intensive study of the cat. Textbook, laboratory guide. Laboratory, lectures, quizzes. Johnson and Assistant.

23-24. ENTOMOLOGY. Elements of entomology leading up to discussion of the principles of taxonomy and their application to the classification of insects. Textbook, lectures, quizzes, and laboratory work. OESTLUND and Assistant.

28. ORNITHOLOGY. Study of structure, classification, and habits of birds with special reference to birds of Minnesota. Considerable time devoted to field study. Bird or field glasses and handbook required. Laboratory, lectures, and quizzes. Limited to ten. ROBERTS.

30. ELEMENTS OF NEUROLOGY. A brief study of the nervous system; intended for students in psychology and the social sciences. JOHNSTON.

*31-32. NATURE STUDY. Discussions, reference, field and laboratory work, through the year once a week and, in addition, field trips Saturday afternoons during the autumn and spring months. Especially for the fitting of teachers in secondary schools. SIGERFOOS.

*51. PROTOZOOLOGY. Lectures, reference, and laboratory work on the structure and life-histories of Protozoa. Special reference is paid to the relations of the Protozoa to diseases of animals. SIGERFOOS.

*56. MORPHOLOGY OF INVERTEBRATES. An intensive study of the Crustacea and some of the smaller phyla of the animal kingdom. Mainly reference and laboratory work. SIGERFOOS.

## ADVANCED AND GRADUATE COURSES

*101-102. ADVANCED ENTOMOLOGY. Advanced work in the lines of morphology and histology; or classification of insects with lectures on the history of entomology. Lectures and laboratory. OESTLUND and CHAPMAN.

*107-108. GENERAL ECOLOGY OF INSECTS. General ecology with special reference to the insects of Minnesota. Frequent field trips made whenever the weather allows. Lectures, laboratory, and field work. OESTLUND and CHAPMAN.

*117-118. MAMMALOGY. Structure and classification of North American mammals. The mammalian skeleton; its modifications; consideration of our domestic animals; dissection of a typical mammal. Classification, natural history and geographic distribution with special reference to Minnesota mammals. JOHNSON.

*119-120. VERTEBRATE HISTOLOGY. Primarily advanced work on vertebrate tissues. Conference, reference and laboratory work. DOWNEY.

*123-124. BLOOD OF VERTEBRATES. A comparative study of blood and blood-forming organs of vertebrates. A portion of time to be devoted to research. DOWNEY.

*131-132. EMBRYOLOGY. A brief survey of general embryology, and the organogeny of the vertebrates with special reference to the circulatory system. Conference, reference and laboratory work with Kel-

licott's *General Embryology* and *Outlines of Chordate Development* as texts. NACHTRIEB.

*143-144. GENETICS AND EUGENICS. Facts and theories of heredity and the application of the laws governing natural inheritances for the improvement of a race. Lectures, reference, conference, and laboratory work. NACHTRIEB.

*161-162. PROBLEMS. Advanced work in some special line. DOWNEY, JOHNSON, JOHNSTON, LUND, NACHTRIEB, OESTLUND, SIGERFOOS.

## ECONOMIC ZOOLOGY

### COLLEGE OF AGRICULTURE

Professor FREDERICK L. WASHBURN; Associate Professor ARTHUR G. RUGGLES; Assistant Professors CHARLES W. HOWARD, WILLIAM MOORE.

### COURSES

| No. | Title | Credits | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 3 | Economic Entomology | 3 | Jr. | An. Biol. 3 and 4 |
| 4 | Economic Vertebrate Zoology | 2 | Jr., sr. | An. Biol 3 and 4 |
| 14 | Insects and Public Health | 2 | Jr., sr. | An. Biol 3 and 4 |
| *18 | Control of Insect Pests | 3 | Jr., sr. | 3, Pl. Path. 14, Hort., 1 sem. |
| *104 | Methods in Economic Entomology | 3 | Jr., sr. | 3 |
| *105-106 | Special Problems | 6 | Jr., sr. | 3 |
| *107-108 | Immature Stages of Insects | 3 or 6 | Jr., sr. | 3 |
| *109-110 | Action of Insecticides | 3 or 6 | Jr., sr. | 3 |

### INTRODUCTORY COURSES

3. ECONOMIC ENTOMOLOGY. A consideration of the most important insect pests; methods of control; insecticides and insecticidal apparatus; beneficial insects. All students entering this course make a collection of insects. WASHBURN, RUGGLES, HOWARD, MOORE.

4. ECONOMIC VERTEBRATE ZOOLOGY. The relation of birds and four-footed wild animals to agriculture. Laboratory and field work. Identification of Minnesota birds affecting the horticulturist and agriculturist; also of vertebrate farm pests, study of habits, methods of combating, etc. WASHBURN.

14. INSECTS AND PUBLIC HEALTH. A consideration of the agency of insect-like animals in the transmission of disease, as well as general household insects; also methods of sanitation, etc., related to their control and disease transmission. HOWARD.

18. CONTROL OF INSECT PESTS. The principal insects of the orchard and garden are studied in detail. The last part of the course deals with spray materials and their method of application. RUGGLES, MOORE.

### ADVANCED AND GRADUATE COURSES

104. METHODS IN ECONOMIC ENTOMOLOGY. Methods of breeding insects; identification of insects in various stages; photography of insects; general field work, etc. MOORE.

105-106. SPECIAL PROBLEMS. Investigations of special problems for those intending to specialize in entomology or economic zoology. Problems may be chosen in any section of the Division. Students are expected to be in attendance during the Summer Session. WASHBURN, RUGGLES, HOWARD, MOORE.

107-108. IMMATURE STAGES OF INSECTS. A study of immature forms of economic insects. Laboratory work. RUGGLES.

109-110. ACTION OF INSECTICIDES. A study of the common insecticides and their action on insects and their hosts. Laboratory and conference work. MOORE.

## ASTRONOMY

Professor FRANCIS P. LEAVENWORTH; Assistant Astronomer WILLIAM O. BEAL.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* Courses 51-52 and 101-102 (the latter taken as a three-hour course) or Courses 13-14 and 101-102 (the latter taken as a three-hour course).

*For a Major,* Courses 21, 51-52, and 101-102 (the latter taken as a six-hour course), and Mathematics 4.

*For B.A. with Honors,* the general requirements (page 24), Courses 51-52, 101-102 (as a six-hour course), and six credits in Physics.

### ASTRONOMICAL OBSERVATORY

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.

### COURSES

| No. | Credit | Title | | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|---|
| 9-10 | 3 | Descriptive Astronomy ... | | | Soph., jr., sr. | | None |
| | | 7:30 | T | | 124F | Beal | |
| 11a | 3 | Descriptive Astronomy ... | | | Soph., jr., sr. | | None |
| | | 9 | MWF | | 124F | Leavenworth | |
| | | 11 | TThS | | 124F | Beal | |
| 11b | 3 | Descriptive Astronomy ... | | | Soph., jr., sr. | | None |
| | | 11 | MWF | | 124F | Leavenworth | |
| | | 11 | TThS | | 124F | Beal | |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 13-14 | 6 | Descr. Astr. & Obs. Pract.<br>9 TThS | Soph., jr., sr.<br>124F Beal | None |
| *51-52 | 6 | General Astronomy .....<br>2 MWF | Jr., sr.<br>124F Leavenworth | 1 yr. mathematics |
| 62a | 3 | Elements of Pract. Astr...<br>Ar Ar | Soph., jr., sr.<br>124F Beal | 1 yr. mathematics |
| 62b | 3 | Elements of Pract. Astr...<br>Ar Ar | Soph., jr., sr.<br>124F Beal | 1 yr. mathematics |
| *101-102 | 6 or 12 | Practical Astronomy .....<br>10 TThS or MTWThFS | Jr., sr., grad.<br>124F Leavenworth | Math. 7 and 11 |
| *140 | 2 | Method of Least Squares..<br>Ar Ar | Sr., grad.<br>O Leavenworth | Math. 51 |

9-10. DESCRIPTIVE ASTRONOMY. Same as Course 11. One evening session each week, one and one-half hours long, throughout the year. BEAL.

11a,b. DESCRIPTIVE ASTRONOMY. Lectures on the Elements of Astronomy, illustrated by lantern slides. LEAVENWORTH, BEAL.

13-14. DESCRIPTIVE ASTRONOMY AND OBSERVATORY PRACTICE. Lectures and recitations on the Elements of Astronomy; lectures illustrated by lantern slides. Laboratory exercises, problems, and telescopic observations. No credit given until both semesters are completed. BEAL.

*51-52. GENERAL ASTRONOMY. A thoro study of the general principles of Astronomy, illustrated by lantern slides and telescopic observations. No credit is given until both semesters are completed. LEAVENWORTH.

62a,b. ELEMENTS OF PRACTICAL ASTRONOMY. Theory and use of astronomical instruments in determining time, latitude, longitude, and positions of heavenly bodies. BEAL.

*101-102. PRACTICAL ASTRONOMY. Theory and use of astronomical instruments in determining time, latitude, longitude, positions of heavenly bodies; astronomical photography, with measures of plates; study of the method of least squares. LEAVENWORTH.

*140. METHOD OF LEAST SQUARES. The combination and adjustment of observations and the discussion of their precision as applied especially to Engineering, Physics, and Astronomy. LEAVENWORTH.

## BACTERIOLOGY

Associate Professor WINFORD P. LARSON; Instructors ARTHUR T. HENRICI, ANNE BENTON.

### COURSES

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 58a | 4 | General Bacteriology .....<br>2, 3 MWF | Soph., jr., sr.<br>Lab. PHP | Gen. Chem. and Zool. 1-2 or Bot. 1<br>Larson |
| 58b | 4 | General Bacteriology .....<br>Ar Ar | Jr., sr.<br>PHP | Bact. 58<br>Larson |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *59 | 3 | Special Bacteriology ..... | Jr., sr., grad. | Bact. 58 |
| | | Ar Ar | PHP | ¶ |
| *104 | 3 | Special Bact. Technique... | Soph., jr., sr. | Gen. Chem. and Zool. 1-2 or Bot. 1 Bact. 58a, 59 |
| | | 2, 3 MWF | Lab. PHP | Larson, et. al. |

58a or 58b. General Bacteriology. Preparation of culture media. The morphology of bacteria. Methods of staining and of identification. Anaerobic bacteria. Principles of sterilization and disinfection. Examination of air, water, milk. Relation of bacteriology to the industries. Larson, Benton, Henrici.

*59. Special Bacteriology. Study of pathogenic bacteria. Bacteriological methods in clinical diagnosis. Principles of infection and immunity with practical application of serum reactions. Larson, Benton.

*104. Special Bacteriologic Technique. An advanced course offering an opportunity for additional work in bacteriology and affording the opportunity of working out special problems. Limited to ten students. Larson.

## BOTANY

Professors Frederic E. Clements, Carl Otto Rosendahl, Josephine E. Tilden; Assistant Professors Herbert F. Bergman, *Frederic K. Butters, Ned L. Huff; Instructor William S. Cooper; Assistants Donald Folsom, Frances L. Long, Harvey Stallard, Vinnie A. Pease; Teaching Fellow Arthur M. Johnson.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, of which not more than six credits may be in introductory courses.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 24); thirty-six credits in Botany, of which twenty-four shall be selected from advanced courses 105-106 to 119-120 inclusive. Those electing the Honors Course are urged to secure twelve credits during the sophomore year.

*For a Teacher's Certificate,* an average of at least one honor point for each credit hour in one introductory and one intermediate course, and in Course 121-122. One year of Zoology is also advised.

Students entering the department without preparation must take Course 1, followed by 2, 3b or 4. Students coming from an approved high school course will take Course 1a, 2 or 3a according to preparation. Those who expect to pursue botany for a single year only will take Course 3b or 4 during the second semester, while those who plan to take a major in botany are advised to take Course 2.

* On leave for the year 1916-17.

## COURSES

### *Introductory Courses*

| No. | Credits | Title | | Offered to | | Prerequisite Courses |
|---|---|---|---|---|---|---|
| 1a | 3 | General Bot. Lab. & Class | | All | | None |
| | | 8, 9 | MWF | 207P | ¶ | |
| | | 10, 11 | MWF | 207P | ¶ | |
| | | 1, 2 | MWF | 207P | ¶ | |
| | | 2, 3, 4 | MF | 212P | ¶ | |
| | | 3, 4 | MWF | 207P | ¶ | |
| | | 8, 9 | TThS | 207P | ¶ | |
| | | 10, 11 | TThS | 207P | ¶ | |
| | | 2, 3, 4 | TTh | 212P | ¶ | |
| 1b | 3 | General Bot. Lab. & Class | | All | | None |
| | | 8, 9 | MWF | 207P | ¶ | |
| | | 2, 3, 4 | MF | 207P | ¶ | |
| 2a | 3 | Structural Botany ..... | | All | | 1, 3a or approved High School Botany |
| | | 1, 2 | MWF | 214P | ¶ | |
| 2b | 3 | Structural Botany ..... | | All | | 1, 3a or approved High School Botany |
| | | 10, 11 | MWF | 207P | ¶ | |
| | | 2, 3, 4 | MF | 214P | ¶ | |
| | | 2, 3, 4 | TTh | 207P | ¶ | |
| 3a | 3 | Evolution of Plants ..... | | All | | 1 or approved High School Botany |
| | | 10, 11 | MWF | 212P | ¶ | |
| 3b | 3 | Evolution of Plants..... | | All | | 1 or approved High School Botany |
| | | 10, 11 | MWF | 212P | ¶ | |
| | | 1, 2 | MWF | 212P | ¶ | |
| | | 2, 3, 4 | TTh | 212P | ¶ | |
| 4 | 3 | Field and Garden Botany. | | All | | 1, 2 or 3a |
| | | 8, 9 | MWF | 1G | ¶ | |
| | | 10, 11 | MWF | 1G | ¶ | |
| | | 1, 2 | MWF | 1G | ¶ | |
| | | 3, 4 | MWF | 1G | ¶ | |
| | | 2, 3, 4 | MF | 2G | ¶ | |
| | | 8, 9 | TThS | 1G | ¶ | |
| | | 10, 11 | TThS | 1G | ¶ | |
| | | 2, 3, 4 | TTh | 1G | ¶ | |

### *Intermediate Courses*

| No. | Credit | Title | | Offered to | | Prerequisite Courses |
|---|---|---|---|---|---|---|
| 5-6 | 6 | Plant Morphology ..... | | Soph., jr., sr. | | 6 cred.: see statement |
| | | 10, 11 | MWF | 206P | Huff | |
| 7-8 | 6 | Taxonomy ..... | | Soph., jr., sr. | | 6 cred.: see statement |
| | | 10, 11 | MWF | 20P | Rosendahl | |
| | | 2, 3, 4 | TTh | 20P | Rosendahl | |
| 9-10 | 6 | Physiology and Ecology.. | | Soph., jr., sr. | | 6 credits |
| | | Class 3 | MF | 210P | Clements | |
| | | Lab. 1, 2 | MF | 3G | Cooper | |
| | | Class 3 | TTh | 210P | Clements | |
| | | Lab.. 1, 2 | TTh | 3G | Cooper | |
| 11-12 | 6 | Industrial Botany ..... | | Soph., jr., sr. | | 6 credits, inc. 2 or 3 |
| | | 10, 11 | TThS | 212P | Tilden | |
| 13-14 | 6 | Mycology..... | | Soph., jr., sr. | | 6 credits |
| | | Not offered in 1916-17. | | | | |

*Advanced Courses*

| No. | Credit | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| *103 | 3 | Foodstuffs and Textiles... Not offered in 1916-17. | Jr., sr., grad. | 9 credits |
| *105-106 | 6 | Algae ..... 1, 2, 3 TTh | Jr., sr., grad. 212P Tilden | 9 credits |
| *107-108 | 6 | Mosses and Ferns ..... Not offered in 1916-17. | Jr., sr., grad. | 9 credits, inc. 2 or 3, or 5-6 |
| *110 | 6 | Gymnosperms ..... Not offered in 1916-17. | Jr., sr., grad. | 7-8 or 107-108 |
| *111-112 | 6 | Advanced Taxonomy .... Not offered in 1916-17. | Jr., sr., grad. | 7-8 |
| *113-114 | 6 | Advanced Ecology ..... Ar Ar | Jr., sr., grad. 200P Clements and Cooper | 9-10 |
| *115-116 | 6 | Advanced Plant Physiology Ar Ar | Jr., sr., grad. 200P Clements and Bergman | 9-10 |
| *117-118 | 6 | Cytology ..... .... Ar Ar | Jr., sr., grad. 8P Rosendahl | 18 credits |
| *119-120 | 6 | Advanced Industrial Bot. Not offered in 1916-17. | Jr., sr., grad. | 11-12 |
| *121-122 | 6 | Plant Studies & Methods. 4 MWF | Jr., sr., grad. 200P Clements | 12 credits |

## INTRODUCTORY COURSES

1a,b. General Botany. A study of the external form and organs of flowering plants, root, stem, leaf, fruit and seed, and of their relations to each other, together with simple greenhouse experiments to illustrate the various functions. Clements, Huff, Bergman, Cooper, Folsom, Long, Stallard.

2a,b. Structural Botany. A study of the microscopic structure of flowering plants, the cell, tissues and tissue systems, as seen in the root, stem, leaf, etc. Huff, Stallard.

3a,b. Evolution of Plants. A comparative microscopic study of selected types of plants, illustrating the evolution of land plants from the simplest forms. Tilden, Huff.

4. Field and Garden Botany. Greenhouse, garden and field study of the form, behavior, naming, and relationships of flowering plants, together with individual problems in the pollination, reproduction and propagation of common lower types. Clements, Bergman, Cooper, Folsom, Long, Stallard.

## INTERMEDIATE COURSES

5-6. Plant Morphology. A comparative study of the form, structure, and life history of typical algae, fungi, liverworts, mosses, ferns, and seed plants. Course 6 (but not 5) open to those who have taken Course 3. Huff.

7-8. TAXONOMY. A general study of the classification and relationships of flowering plants. Laboratory and field practice in the determination of species, together with lectures and quizzes. ROSENDAHL.

9-10. PLANT PHYSIOLOGY AND ECOLOGY. Greenhouse study of the growth and behavior of plants, and field study of plant communities and their environment in fall and spring. CLEMENTS, COOPER.

11-12. INDUSTRIAL BOTANY. Laboratory study of the plants useful to man, including those which furnish food, shelter, fuel, clothing, etc. TILDEN.

13-14. MYCOLOGY. The classification and life history of the various groups of fungi, based on identification, field work, and cultures. Not offered in 1916-17. CLEMENTS.

ADVANCED COURSES

*103. PLANT FOODSTUFFS AND TEXTILES. A special study of the botany of foods, textile fibers and fabrics, together with an inquiry into the relation of plants to household processes and problems. For young women. TILDEN.

*105-106. ALGAE. A detailed comparative study of the structure and classification of the algae, including an examination of blue-green and green freshwater forms and the more important brown and red marine species. TILDEN.

*107-108. COMPARATIVE MORPHOLOGY OF MOSSES AND FERNS. Designed for students who wish to pay special attention to the morphology and taxonomy of liverworts, mosses, and ferns. Lecture, laboratory, and field work. Not offered in 1916-17. BUTTERS.

*110. MORPHOLOGY AND TAXONOMY OF GYMNOSPERMS. A comparative 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. Not offered in 1916-17. BUTTERS.

*111-112. ADVANCED TAXONOMY. 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. Not offered in 1916-17. ROSENDAHL.

*113-114. ADVANCED ECOLOGY. Critical quantitative study of adaptations produced by water and light (autecology), in 1916-17; an examination of plant formations (synecology), in 1917-18. Discussion, quizzes, field or greenhouse work. CLEMENTS, COOPER.

*115-116. ADVANCED PLANT PHYSIOLOGY. The interrelations of factor, function, and structure with special reference to the food cycle (photosynthesis, respiration, and growth) in 1916-17, and to the water cycle (absorption, transport and transpiration) in 1917-18. Discussions, quizzes, and greenhouse work. CLEMENTS, BERGMAN.

*117-118. CYTOLOGY. A survey of cell structure and the various phenomena of division, fusion, and metamorphosis, together with a review of the history of cytological investigation. Methods of cytological research indicated in the laboratory. ROSENDAHL.

*119-120. ADVANCED INDUSTRIAL BOTANY. A study of the origin, distribution, and cultivation of plants yielding products of economic value; the nature and uses of these products and the processes by which they are obtained from the plants. TILDEN.

*121-122. PLANT STUDIES AND METHODS. The subjects of nature-study and high-school botany presented as they are to be taught; the material considered in detail in proper sequence, and training in method afforded by practice in the University and Minneapolis High Schools. CLEMENTS.

## CHEMISTRY

### THE SCHOOL OF CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Associate Professor EVERHART P. HARDING; Assistant Professors IRA H. DERBY, WILLIAM H. HUNTER, EDWARD E. NICHOLSON; Instructors ROSS A. BAKER, FRANK W. BLISS, LILLIAN COHEN, J. GERHARD DIETRICHSON, WOLF KRITCHEVSKY, FRANK H. MACDOUGALL, CARL L. SCHUMANN, WOLDEMAR STERNBERG, EARLE K. STRACHAN, H. LEE WARD; Assistants ARTHUR R. CADE, D. D. CUNNINGHAM, ELMER T. FEGAN, FLOYD E. JOYCE, WALTER M. LAUER, ALLEN F. NEWMAN, S. JOSEPH REICHERT.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

In Chemistry the purpose of the honors course is served by the Five-Year Course in Arts and Chemistry. (See page 31.)

*For a Teacher's Certificate,* an average of at least one and one-half honor points for each credit hour in Courses 1-2 or 3-4 and 7-8 or 11-12; and 20.

### COURSES

*Division of General and Inorganic Chemistry*

| No. | Credits | Title | | Offered to | | Prerequisite Courses |
|---|---|---|---|---|---|---|
| 1-2 | 6† | General Chemistry ..... | | Those entering without chemistry | | None |
| | | 8, 9 | TThS | 110 | ¶ | |
| | | 10, 11 | MWF | 110 | ¶ | |
| 21-22 | 6† | Inorganic and Qual. Chem. | | Those entering without chemistry | | None |
| | | Lect. 1 | M | 100 | ¶ | |
| | | Lab. 8, 9 | TTh | 110 | ¶ | |
| | | Rec. 10 | TThS | 111 | ¶ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3-4 | 6† | Adv. Gen. Chemistry and Qualitative Analysis .... | | Fr., soph., jr. | | Entrance credit in chemistry |
| | | Lect. 1 | M | 100 | ¶ | |
| | | Lab. 2, 3 | MW | 110 | ¶ | |
| | | Rec. 2 or 3 | F | 111 | ¶ | |
| | | Lab. 10, 11 | TTh | 110 | ¶ | |
| | | Rec. 10 or 11 | S | 115 | ¶ | |
| 7-8 | 6† | Qualitative Analysis ..... | | Soph., jr., sr. | | 1-2 |
| | | 8, 9 | MWF | 210 | Nicholson | |
| | | 10, 11 | MWF | 210 | Bliss | |
| 10 | 1 | Glass Blowing ..... | | Jr., sr. | | None |
| | | Ar | Ar | 49 | Baker | |
| 17 | 2 | Inorganic Colloquium ... | | Sr. | | 11-12 |
| | | 11 | MW | 111 | Baker | |
| 20 | 2 | Teachers' Course ..... | | Sr. | | 3-4 or 7-8 or 21-22 |
| | | Ar | Ar | Ar | Ward | |
| *167-168 | 4† | Adv. Inorganic Chemistry | | Jr., sr. | | 2 yrs. college chem. |
| | | Ar | Ar | Ar | Baker | |
| *169-170 | 4† | Chem. of Rare Elements.. | | Jr., sr. | | 11-12 |
| | | Ar | Ar | Ar | Nicholson | |

*Division of Analytical Chemistry*

| No. | Credits | Title | | Offered to | | Prerequisite Courses |
|---|---|---|---|---|---|---|
| *11-12 | 8† | Quantitative Analysis ..... | | Jr., sr. | | 3-4 or 7-8, or 21-22 and 1 yr. math. or Physics 1 |
| | | 1-5 | F | 310 | Sidener | |
| | | 2-5 | MW | 310 | Sidener | |
| *107-108 | 6† | Adv. Quantitative Anal... | | Jr., sr. | | 11-12 |
| | | Ar | Ar | 317 | Sidener | |

*Division of Organic Chemistry*

| No. | Credits | Title | | Offered to | | Prerequisite Courses |
|---|---|---|---|---|---|---|
| 13-14 | 6† | Medical Organic Chem... | | Soph. | | 3-4 or 7-8 or 21-22 |
| | | Lect. 1 | WF | 325 | Hunter | |
| | | Lab. 2-5 | T | 10 | Hunter | |
| | | Lab. 3 hrs. | Ar. | 10 | Hunter | |
| 18 | 2 | Organic Colloquium ..... | | Sr. | | 35-36 |
| | | Ar | Ar | Ar | Frankforter | |
| *35-36 | 8† | Organic Chemistry ..... | | Jr., sr. | | 3-4 or 7-8 or 21-22 and 1 yr. Biol. Sci. |
| | | Lect. 11 | TTh | 100 | Frankforter | |
| | | Lab. 2-5 | MW | 10 | Kritchevsky | |
| | | Rec. 1 | W | 315 | Kritchevsky | |
| *115 | 2 | Adv. Organic Chemistry. | | Sr. | | 35-36 |
| | | Ar | Ar | Ar | Hunter | |
| *116 | 2 | Theoretical Organic Chem. | | Sr. | | 35-36 |
| | | Ar | Ar | Ar | Hunter | |

*Division of Physical Chemistry*

| No. | Credits | Title | | Offered to | | Prerequisite Courses |
|---|---|---|---|---|---|---|
| *121-122 | 4† | Physical Chemistry ..... | | Jr., sr. | | 35-36, Physics 2 and 4 |
| | | 11 | WF | 115 | Derby | |
| *123-124 | 2† | Physico-chemical Lab. ... | | Jr., sr. | | Must be taken in conjunction with 121-122 |
| | | 2-5 | F | 117 | Derby | |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *125-126 | 6† | Adv. Physical Chemistry. | Sr. | 121-122 |
| | | Ar Ar | Ar Derby | |
| *128 | 2 | Radiochemistry ..... | Jr., sr. | 3-4 or 7-8 or 21-22 and Physics 2 and 4 |
| | | Ar Ar | Ar Derby | |

*Division of Technological Chemistry*

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 27-28 | 4† | Chem. in Every-Day Life. | Jr., sr. | 3-4 or 7-8 or 21-22 |
| | | 2-5:30 TTh | Ar Frankforter and Harding | |

*Division of Industrial Chemistry*

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 15 | 2 | Photochemistry ..... | Jr., sr. | 3-4 or 7-8 or 21-22 |
| | | Lect. 8 M | 27 Strachan | |
| | | Lab. 2-5 Th | 27 Strachan | |
| 16 | 2 | Color Photography ..... | Jr., sr. | 15 |
| | | Lect. 8 M | 27 Strachan | |
| | | Lab. 2-5 Th | 27 Strachan | |

† Both semesters must be completed before credit is given for the first semester.
‡ This physics may be taken at the same time.

## DIVISION OF GENERAL AND INORGANIC CHEMISTRY

1-2. General Chemistry. A study of the metallic and non-metallic elements, with a brief introduction to organic chemistry. Cohen and Assistants.

3-4. Advanced General Chemistry and Qualitative Analysis. This course includes a study of the chemical elements and their more important compounds, the acid and basic qualitative analysis, and a consideration of the important laws and theories of chemistry. Frankforter, Dietrichson, and Assistants.

7-8. Qualitative Analysis. The general reactions of the metals and acids with their qualitative separation. The ionic theory and the law of mass action with special reference to common qualitative reactions. Nicholson, Bliss, and Assistants.

10. Glass Blowing. The course includes the methods used in the construction and repair of simple glass apparatus. Baker.

17. Colloquium in Inorganic Chemistry. A thoro quiz in inorganic chemistry. Baker.

20. Teachers' Course. For those who expect to teach Chemistry. Ward.

21-22. Inorganic and Qualitative Chemistry. This includes a study of the non-metals, metals, and qualitative analysis, together with a thoro discussion of the fundamental laws and theories of chemistry. Cohen.

*167-168. Advanced Inorganic Chemistry. Designed to systematize and broaden the student's knowledge of inorganic chemistry. Based largely on the periodic system. Important types of chemical reac-

tions studied with reference to their analytical and industrial significance. Lectures, recitations, assigned reading. BAKER.

*169-170. CHEMISTRY OF THE RARE ELEMENTS. The descriptive chemistry of the rare elements and their analytical separation. NICHOLSON.

DIVISION OF ANALYTICAL CHEMISTRY

*11-12. QUANTITATIVE ANALYSIS. First semester: A general discussion of quantitative methods, with laboratory work in gravimetric analysis. Second semester: A discussion of standard solutions and the necessary stoichiometric calculations with laboratory work in volumetric analysis. Prerequisite, one year of chemistry, and one year of physics or of mathematics. SIDENER, STERNBERG, and Assistants.

*107-108. ADVANCED QUANTITATIVE ANALYSIS. The work in this course will be adapted as far as possible to the needs and desires of the individual students. SIDENER.

DIVISION OF ORGANIC CHEMISTRY

13-14. MEDICAL ORGANIC CHEMISTRY. The chemistry of carbon, including ing the preparation of some of the important organic compounds. Emphasis laid on the parts of organic chemistry most important in medicine. Open only to students in Arts and Medicine Course. HUNTER, KRITCHEVSKY, and Assistants.

18. COLLOQUIUM IN ORGANIC CHEMISTRY. A thoro quiz in general organic chemistry. FRANKFORTER.

*35-36. ORGANIC CHEMISTRY. The aliphatic and the aromatic series with the preparation of the more important compounds. Prerequisite, one year of chemistry, and one year of biological science. FRANKFORTER, KRITCHEVSKY, and Assistants.

*115. ADVANCED ORGANIC CHEMISTRY. Selected topics: constitution work, quinones, etc.; the study of organic reactions. HUNTER.

*116. THEORETICAL ORGANIC CHEMISTRY. A consideration of theories that apply especially to carbon compounds, such as relation of properties to constitution, the carbon valence theory. HUNTER.

DIVISION OF PHYSICAL CHEMISTRY

*121-122. PHYSICAL CHEMISTRY. A consideration of the theories and laws, phenomena and processes which form the basis of chemical science. Charts, models, and experiments employed to supplement and illustrate the discussions. DERBY, MACDOUGALL.

*123-124. PHYSICO-CHEMICAL LABORATORY PRACTICE. Physico-chemical methods and measurements. Open only to students pursuing Course 121-122, or who have had it or its equivalent. DERBY, MACDOUGALL.

*125-126. ADVANCED PHYSICAL CHEMISTRY. The theories of chemistry treated systematically from the standpoint of thermodynamics and the molecular theory. Suited to the needs of candidates for the higher degrees and all others interested in the advances of modern physical chemistry. DERBY.

*128. RADIOCHEMISTRY. The occurrences, methods of isolation and investigation, and physico-chemical properties of the radioactive substances, together with a brief consideration of the chemical, geological, and biological bearing of the subject. DERBY.

### DIVISION OF TECHNOLOGICAL CHEMISTRY

27-28. CHEMISTRY OF EVERY-DAY LIFE. A discussion of the inorganic and organic substances used in every-day life. FRANKFORTER, HARDING.

### DIVISION OF INDUSTRIAL CHEMISTRY

15. PHOTOCHEMISTRY. A discussion of the general principles of photochemistry and their application to dry-plate photography and the ordinary printing processes. STRACHAN.

16. COLOR PHOTOGRAPHY. Theory and practice in the preparation and use of orthochromatic and panchromatic plates; photography in natural colors. STRACHAN.

## COMPARATIVE PHILOLOGY

Professor FREDERICK KLAEBER.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* Courses 101, 102, 106, 109, 110, 141.

*For a Major,* Courses 101, 102, 106, 109, 110, 141, with German 3-4 (or 5-6) and 7-8 and English 1-2, 3 as prerequisites.

*For B.A. with Honors.* The required credits in the major may be elected from the undergraduate courses of the department and English 8, 101, 103 and German 107-108.

This department, besides offering courses in the general principles of linguistic science, affords an opportunity for elementary studies in Comparative Indo-European Philology, and more particularly the investigation of Old Germanic dialects. Related courses in English Philology will be found under English Language and Literature.

### COURSES

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| *101 | 2 | Science of Language ... 2 WF | Jr., sr., grad. 205F Klaeber | See statement |
| *102 | 2 | Sci. of Language (Adv.). See statement | Jr., sr., grad. | Same as for 101 |
| *104 | 2 | Germanic Philology ..... See statement | Jr., sr., grad. | Same as for 101 |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *105 | 1 | Universal Language ..... 10 S | Jr., sr., grad. 302F Klaeber | Same as for 101 |
| *106 | 2 | Life of Words..... 2 WF | Jr., sr., grad. 205F Klaeber | Same as for 101 |
| *109-110 | 4† | History of the German Language ..... See statement | Sr., grad. | German 53, 54 |
| *141-142 | 4 | Historical Grammar of the English Language ..... 2 TTh | Jr., sr., grad. 205F Klaeber | English 1-2, 3 |

† Both semesters must be completed before credit is given for either semester.

*101. General Introduction to the Science of Language. Sufficiently general to be of use to all students who wish to obtain an insight into the life of language. Prerequisites: (1) five years of foreign language, one necessarily in college; (2) two years of foreign language in college; (3) six credits in Old English; (4) Courses 3 and 5 in English. Klaeber.

*102. Science of Language (Advanced Course). Investigation of linguistic problems. Study of standard works. Reports on recent publications. Alternates with Course 106. Not given in 1916-17. Klaeber.

*104. Introduction to Germanic Philology. Not given in 1916-17. Klaeber.

*105. The Universal Language. Comparison of the principal families of languages in grammatical and lexical respects. History of the movement for the creation of an international language. Consideration of Volapük, Esperanto, Ido, and other artificial languages. Klaeber.

*106. The Life of Words. Etymology and semasiology. Growth of vocabulary; change of words in form and meaning. Lectures and exercises with special reference to English and other Germanic languages. Alternates with Course 102. Klaeber.

*109-110. History of the German Language. Lectures, discussions, assigned readings. Course may be conducted in German. Alternates with Course 141-142. Identical with German 109-110. Not given in 1916-17. Klaeber.

*141-142. Historical Grammar of the English Language. (1) Sounds and Spelling. (2) Accidence and Syntax. Alternates with Course 109-110. Identical with English 141-142. Klaeber.

## DRAWING AND DESCRIPTIVE GEOMETRY

Professor William H. Kirchner; Instructor Robert W. French.

### COURSES

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 21-22 | 4 | Technical Drawing..... 8, 9 MWF | All 13MechE | None . Kirchner, French, et al. |

21-22. TECHNICAL DRAWING. Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings, and translations. KIRCHNER, FRENCH, et al.

## ECONOMICS

Professors JOHN H. GRAY, E. DANA DURAND; Assistant Professors ROY G. BLAKEY, J. FRANKLIN EBERSOLE, *THOMAS WARNER MITCHELL; Instructors LLOYD M. CROSGRAVE, WILLIAM W. CUMBERLAND, HARRY D. HARPER, ALBERT C. JAMES, ROBERT J. MCFALL, WILLIAM A. PATON; in the General Extension Division, Associate Professor CLARE L. ROTZEL; Assistant Professors CHARLES H. PRESTON, *GERHARD A. GESELL; Instructor RAYMOND V. PHELAN.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits, including Course 4.

*For B.A. with Honors,* thirty credits in the major line of work with the usual supporting credits, and not less than sixty credits altogether in Group B.

*For a Teacher's Certificate in business subjects,* a major in Economics, including Accounting and Economic Geography.

*Vocational Course in Business Education.* The requirements for this course leading to the B.A. degree may be found on pages 27-29.

The departments of Economics, Political Science, History, and Sociology and Anthropology constitute a social science group. The subjects are intimately inter-related, and they are all of special importance to students who intend to engage in law, business, public service at home or abroad, journalism, the work of charities and corrections, or to give instruction in one of the social sciences. Students who are interested in the work of any one of the departments of the social science group ought to be familiar with at least the elements of the subjects offered in the other departments. A student who takes his major in any one of them ought to have more than the elements of the others.

For admission to candidacy for the Master's degree students must have twelve credits in Economics including the equivalent of Courses 3-4, (General Economics). They must also satisfy the Department that they have had an adequate training in the other social sciences for the particular work they wish to do.

### SUGGESTIONS AS TO COURSES IN THE DEPARTMENT

In order to aid students who have some idea as to their intended profession or calling to make a wise choice of courses, the accompanying tabular statement has been prepared.

These recommendations are merely suggestive and more courses are sometimes recommended than suffice to make up a technical minor or

* Leave of absence, 1916-17

major in order that students may choose those courses which interest them the most.

Courses 7 and 8 are not included in these recommendations, as they must, in any case, precede the advanced courses, since they are required of all taking a major in Economics.

Students desiring merely a general acquaintance with Economics as part of a liberal education and as a preparation for citizenship are recommended to take the general courses and such others, amounting at least to a minor, as their interests may indicate.

## ECONOMICS

| In preparation for | Courses advised for a minor | Additional advised for a major |
|---|---|---|
| Law | 76, 145, 146, 191 | 43, 104, 143, 174 |
| Public Service | 2, 145, 146, 191 | 35-6, 101, 164 |
| Consular and Diplomatic Service | 2, 13, 72, 76, 101 | 34, 43, 143 |
| Journalism | 2, 43, 145, 146, 173, 191 | 101, 104, 143, 161, 164 |
| Engineering or Railway Service | 49, 145, 146, 173 | 34, 35-6, 142, 161, 174 |
| Chemistry or Manufactures | 2, 15, 76, 145, 161 | 34, 35-6, 101, 131 |
| Mining | 2, 72, 143, 145, 161 | 13, 22, 142 |
| Banking and Finance | 43, 48, 101, 143, 145 | 35-6, 41, 139, 142, 144, 255-56 |
| General Business | 2, 13, 43, 76, 143 | 34, 35-6, 142, 145 |
| Forestry or Agriculture | 13, 15, 18, 22 | 35-6, 43, 143, 173, 251-2 |
| Teaching Business Subjects | 2, 13, 43, 104 | 34, 35-6, 41 |
| Medicine | 2, 43, 164 | 34, 35-6, 42 |
| Social Service Work | 2, 161, 163 | 104, 164, 261-62 |
| The Ministry | 2, 161, 162 | 104, 164 |
| Public Accountancy | 34, 35-6, 132 | 43, 48, 49, 101, 131, 142, 145, 146, 253-54 |
| Insurance | 34, 35-6, 48, 49 | 142, 145, 146 |

## COURSES

### *General Courses*

| No. | Credits | Title | | | Offered to | Prerequisite Courses |
|---|---|---|---|---|---|---|
| 3-4 | 6† | General Economics | | | Soph., jr., sr. | None‡ |
| | | 8 | MWF | 202MA | Blakey, et. al. | |
| | | 9 | TThS | Ar | Blakey, et. al. | |
| | | 9 | MWF | 209MA | Paton | |
| | | 3 | MWF | 209MA | Paton | |
| (Teachers) | 4 to 5:15 | | MW | 109MA | Crosgrave | |
| 3b | 3†† | General Economics | | | Soph., jr., sr. | None‡ |
| | | 11 | TThS | Ar | ¶ | |
| | | 1 | MWF | 202MA | ¶ | |
| 5 | 3 | Economic Development | | | Soph., jr., sr. | None |
| | | See statement | | | | |
| 7a or 7b | 3 | Principles of Economics | | | Soph., jr., sr. | None |
| | | See statement | | | | |
| 8a | 3 | Economic Problems | | | Soph., jr. | 3 or 7 |
| | | 9 | TThS | 213MA | Blakey | |
| | | 1 | MWF | 102MA | Blakey | |

† Both semesters must be completed before credit is given.
†† Credit given only after Course 4 is completed.
‡ Not open to students in the vocational curriculum.

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 9a | 3 | Industrial Hist. since 1750 | Soph., jr., sr. | None |
| | | 10 MWF | 102MA Gray | |
| 9b | 3 | Industrial Hist. since 1750 | Soph., jr., sr. | None |
| | | 10:45 MWF | Ag. Col. Gray | |
| *101 | 3 | Statistics ..... | Jr., sr., grad. | 6 cred. inc. 3 or 7 |
| | | 11 TThS | 303MA Durand | |
| *103 | 3 | Distribution of Wealth ... | Jr., sr. | 3 or 7 |
| | | 10 TThS | 213MA Paton | |
| *104 | 3 | Hist. of Economic Ideas.. | Jr., sr., grad. | 3 or 7 |
| | | 10 TThS | 213MA Paton | |
| *105-106 | 0 | Economic Conference ... | Sr., grad. | Accompanies seminars |
| | | See statement | | |

*Production, Transportation, and Commerce*

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 2b | 3 | Industries and Commerce of the United States.... | Soph., jr., sr. | None |
| | | 11 MWF‡ | 209MA McFall, James | |
| | | Sections for Vocational Students ..... | Fr. | None |
| | Lect. (All) | 9 W | Ar McFall | |
| | Quiz (Sec. 1) | 9 MF | Ar McFall | |
| | Quiz (Sec. 2) | Ar Ar | Ar McFall | |
| | Quiz (Sec. 3) | Ar Ar | Ar James | |
| | Quiz (Sec. 4) | Ar Ar | Ar James | |
| | Quiz (Sec. 5) | Ar Ar | Ar McFall | |
| 13 | 3 | Economic Geography of Foreign Countries ..... | Soph., jr., sr. | 3 credits |
| | | 2 MWF | 202MA McFall | |
| *72 | 3 | Economics of Colonization | Jr., sr. | 6 credits inc. 3 or 7 |
| | | See statement | | |
| *76 | 3 | Commercial Policies ..... | Jr., sr. | 6 credits inc. 3 or 7 |
| | | 10 TThS | 209MA Blakey | |
| *173 | 3 | Railway Problems ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 9 TThS | 202MA McFall | |
| *174 | 3 | Railway Rate Regulation.. | Jr., sr., grad. | 173 |
| | | 9 TThS | 213MA McFall | |

*Business Administration*

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 34 | 3 | Business Management ... | Soph., jr., sr. | 3 or 7 |
| | | 10 TThS | 202MA Harper | |
| 35-36 | 6 | Accounting Principles ... | Soph., jr., sr. | None |
| Sec. 3 | Lect. & Quiz | 10 WF | 301MA Harper | |
| Sec. 1 | Lect. & Quiz | 11 TS | 301MA Harper | |
| Sec. 1 | Lab. | 11 & 12 Th | 301MA Harper | |
| Sec. 4 | Lab. | 1 & 2 Th | 301MA Paton | |
| Sec. 2 | Lect. & Quiz | 2 MF | 301MA Harper | |
| Sec. 2 | Lab. | 2 & 3 W | 301MA Harper | |
| Sec. 3 | Lab. | 1 & 2 T | 301MA Harper | |
| Sec. 4 | Lect. & Quiz | Ar Ar | Ar Paton | |
| 37 | 3 | Marketing of Products... | Soph., jr., sr. | 3 or 7 |
| | | 9 TThS | 209MA James | |
| 39 | 3 | Advertising, Salesmanship, and Commercial Credit. | Soph., jr., sr. | 3 or 7 |
| | | 1 MWF | 202MA James | |

‡ Not open to students in the vocational curriculum.

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *88 | 3 | Retail Merchandising .... | Jr., sr. | 6 credits inc. 37 or 39 |
| | | 9 TThS | 202MA James | |
| *131 | 3 | Cost Accounting ..... | Jr., sr., grad. | 3 or 7, and 35-36 |
| | | 10 TThS | 301MA Harper | |
| *132 | 3 | Accounting Problems .... | Jr., sr., grad. | 3 or 7, and 35-36 |
| | | See statement | | |
| *133 | 3 | Accounting Systems ..... | Sr., grad. | 35-36, and 131 or 132 |
| | | See statement | | |
| *134 | 3 | Auditing ..... | Sr., grad. | 35-36, and 131 or 132 |
| | | See statement | | |
| *139 | 3 | Bank Administration .... | Jr., sr., grad. | 3 or 7, and 43, and consent of instructor |
| | | 2 and 3 TTh | 202MA Ebersole | |

*Finance*

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 41 | 3 | Financial History ..... | Soph., jr., sr. | 3 or 7 |
| | | 10 TThS | 109MA Blakey | |
| 43a | 3 | Banking ..... | Soph., jr., sr. | 3 or 7 |
| | | 11 MWF | 202MA Ebersole | |
| | | 2 MWF | Ar ¶ | |
| 43b | 3 | Banking ..... | Soph., jr., sr. | 3 or 7 |
| | | 9 MWF | 109MA Ebersole | |
| | | 3 MWF | Ar ¶ | |
| 46 | 3 | Personal Insurance ..... | Jr., sr. | 3 or 7 |
| | | 10 TThS | 109MA James | |
| 47 | 3 | Property Insurance ..... | Jr., sr. | 3 or 7 |
| | | 10 TThS | 209MA James | |
| *142 | 3 | Invest. and Speculation.. | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 MWF | 202MA Ebersole | |
| *143 | 3 | Money and Prices ..... | Jr., sr., grad. | 3 or 7, and 41 or 43 |
| | | 10 MWF | 202MA Ebersole | |
| *144 | 3 | Commercial Crises ..... | Jr., sr., grad. | 3 or 7, and 43 or 143 |
| | | 10 MWF | 209MA Ebersole | |
| *145 | 3 | The Modern Business Corporation ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 9 MWF | 102MA Gray | |
| *146 | 3 | Public Utilities ..... | Jr., sr., grad. | 145 |
| | | 9 MWF | 102MA Gray | |
| *191 | 3 | Public Finance ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 TThS | 109MA Blakey | |
| *192 | 3 | State and Local Taxation. | Jr., sr., grad. | 191 |
| | | 11 TThS | 109MA Blakey | |

*Economic Reforms*

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| *161 | 3 | Labor Problems ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 MWF | 213MA Crosgrave | |
| *163 | 3 | Econ. Conditions in Cities | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | See statement | | |
| *164 | 3 | Econ. Functions of State | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 TThS | 209MA Crosgrave | |
| *165 | 3 | History and Theory of Socialism ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 TThS | 213MA Crosgrave | |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *166 | 3 | Trade Unionism and Allied Problems ..... 11 MWF | Jr., sr., grad. 213MA Crosgrave | 6 credits inc. 3 or 7 |
| *168 | 3 | Wages ..... See statement | Jr., sr., grad. | 164 or 166, and consent of instructor |

GENERAL COURSES

3-4. General Economics. Principles that underlie the present industrial order and the main public economic problems of today, such as the labor movement, social insurance, railway, trust, and other monopoly problems. Not open to students in vocational curriculum.

5. Economic Development Prior to 1750. Development of commerce and commercial policies in Europe prior to the Industrial Revolution, as a preparation for the study of modern economic conditions and theories. Textbook, supplemented by lectures and assigned readings. Not given in 1916-17. **Blakey.**

7. Principles of Economics. A study in the principles that underlie the present industrial order. Open only to students in the vocational curriculum.

8. Economic Problems. A survey of the fundamentals in the problems of labor, social insurance, socialism, government ownership, corporations, trusts, monopolies, transportation, banking, protection, free trade, public revenues and expenditures. Open only to students in the vocational curriculum.

9. Industrial History Since 1750. Economic effects of inventions, wars, political changes, increased supply of precious metals, improved transportation, and modifications of business organization; chief emphasis on Great Britain. Gray.

*101. Theory and Practice of Statistics. Principles of collection, tabulation, and interpretation of statistical material, illustrated by present-day statistical data. Lectures, assigned readings, and special investigations by individual members of the class. Durand.

*103. Distribution of Wealth. An advanced course in economic theory devoted chiefly to a study of recent theories of distribution. Assigned readings, reports, and discussions. Paton.

*104. History of Economic Ideas. History of economic thought; scope and logical methods, relation to other social sciences; methods of investigation and instruction. Assigned readings, reports, and class discussions. Hayes.

*105-106. Economic Conference. Monthly meetings of the instructional staff, and advanced students in Economics. Lectures on bibliography by Mr. Gerould; papers prepared for advanced courses presented for criticism; reports on current economic events and literature.

## PRODUCTION, TRANSPORTATION, AND COMMERCE

2a. INDUSTRIES AND COMMERCE OF THE UNITED STATES. Same as 2b, but given at the College of Agriculture. DURAND.

2b. INDUSTRIES AND COMMERCE OF THE UNITED STATES. Agricultural, mining, and manufacturing industries and internal and foreign commerce. Leading individual industries—geographical distribution, methods of organization, production and marketing, and relationships to one another. Textbook, lectures, and assigned readings. DURAND.

13. ECONOMIC GEOGRAPHY OF FOREIGN COUNTRIES. Economic basis of modern civilization; localization of industries; principal extractive, manufacturing, and distributive industries of leading foreign countries, especially markets for American products. Textbook with lectures and special reports. MCFALL.

15. FOREST ECONOMICS AND CONSERVATION. Development of forest policies; relation of forests to other industries; effects of transportation rates and taxation; general problem of the conservation of natural resources. Lectures, assigned readings, and reports. MCFALL.

18. PROBLEMS IN AGRICULTURAL ECONOMICS. The practical economic problems which confront the farmer as a producer, consumer, and citizen; land settlement and development; size of farms; intensity of cultivation; tenancy, credit; marketing; coöperation; taxation, protective duties; foreign markets; transportation. DURAND.

*72. ECONOMICS OF COLONIZATION. Economic causes of human migration; historical survey of colonization with reference to economic bases; colonial commerce in relation to modern commercial and foreign policies; preferential tariffs and imperial federation. Lectures, readings, Not given in 1916-17. MCFALL.

*76. COMMERCIAL POLICIES. Theory of international commerce; free trade, reciprocity, and protection, with special emphasis on the tariff history and policy of the United States; commercial treaties and foreign politics. Lectures, assigned readings, and reports. MCFALL.

*173. RAILWAY PROBLEMS. Survey of railways and railway policy of the United States and representative foreign countries. Railway organization and finance. Railway discriminations, competition, pooling, combination, and associations. Canal and ocean transportation. Transportation and labor. MCFALL.

*174. RAILWAY RATE REGULATION. Rate-making, federal and state legislation, cost and value of service, earnings, valuation, the regulation of particular rates and of entire rate schedules, complications from state and interstate jurisdiction, classification, and representative decisions. MCFALL.

## BUSINESS ADMINISTRATION

34. BUSINESS MANAGEMENT. The principles of efficiency in business operation and forms of organization to apply them; the typical departments of a business; their functions, office organization and administration. Textbook, assigned readings, and lectures. MITCHELL.

35-36. PRINCIPLES OF ACCOUNTING. The purpose and principles of account classification; capital and revenue; accruals; valuation; depreciation; preparation and interpretation of balance sheets, income accounts, and other statements; corporation accounts. A laboratory course with supplementary lectures. HARPER.

37. MARKETING OF PRODUCTS. Foreign and domestic merchandising methods of manufacturers. Problems of wholesalers and commission men; distributing system and market organization; price policies. Problems of the credit department. . JAMES.

39. ADVERTISING AND SALESMANSHIP. Functions and principles of advertising; advertising media; planning and executing an advertising campaign. Copy. Sales management and personal salesmanship. JAMES.

*88. RETAIL MERCHANDISING. Problems and methods of the so-called regular retailer, department stores, and chain stores. Development of retail trade centers. Coöperation between the retailer and the local board of trade. The retailer and the consumer. JAMES.

*131. COST ACCOUNTING. Analysis of production cost; methods of recording materials, labor and machine costs; apportioning indirect expenses; relation of cost to general accounts; use of cost data to enforce operating efficiency. Laboratory with lectures. HARPER.

*132. ACCOUNTING PROBLEMS. A selection from C.P.A. examinations and other sources of difficult problems that confront the public accountant. Not given in 1916-17. MITCHELL.

*133. ACCOUNTING SYSTEMS. The special accounting problems of building societies, banks, department stores, insurance companies, railroad companies, and other types with a description of their accounting systems. Not given in 1916-17. MITCHELL.

*134. AUDITING. Preparation for, and conduct of, an audit; the auditor's report and certification, and legal responsibilities. Textbook, assigned readings, class discussions, and lectures. Not given in 1916-17. MITCHELL.

*139. BANK ADMINISTRATION. The modern commercial bank from the manager's point of view. Legal problems, department functions, profit-making methods, credits. Adjustment of bank policy to prospective business conditions. Lectures, and laboratory work in local banks. EBERSOLE.

## FINANCE

41. FINANCIAL HISTORY OF THE UNITED STATES. American monetary and fiscal legislation from colonial times with especial emphasis upon the distinction between maintaining a standard of value and the providing of a revenue for the needs of government. BLAKEY.

43a or 43b. PRINCIPLES AND PRACTICE OF BANKING. Contemporary banking institutions, their organization and operation; loans, reserves, note issues, clearing houses, domestic and foreign exchange; the banking systems of foreign countries; and the Federal Reserve banks of the United States. EBERSOLE.

46. PERSONAL INSURANCE. Life insurance companies; types of policies and their uses; premium, reserve, surrender values, dividends, and rights and obligations of policy holders. Analysis of accident and liability insurance contracts and methods. Public regulation. JAMES.

47. PROPERTY INSURANCE. Basic theory and critical examination of policy contracts, of fire, marine, other casualty title and credit insurance. Textbook, lectures, and assigned readings. JAMES.

*141. INVESTMENT AND SPECULATION. The social process of saving and investment; government, municipal, corporation, and real estate loans; stock exchange operations and money market influences as they affect the prices and net yield of prime securities. EBERSOLE.

*143. MONEY AND PRICES. The functions of money; the nature of credit; changes in general prices, their causes and effects; international movements of gold; monetary standards and currency systems; the problem of securing an ideal money. EBERSOLE.

*144. PANICS, COMMERCIAL CRISES, AND CYCLES OF TRADE. American business conditions since 1890 with regard to the great cycles of alternate prosperity and depression and financial panics. Critical examination of all the available business barometers designed to forecast similar conditions. EBERSOLE.

*145. THE MODERN BUSINESS CORPORATION. The organizing, financing, and managing of corporations; the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. GRAY.

*146. PUBLIC UTILITIES. Economic and legal bases of classification. Relative advantages of public ownership and regulation. Central and municipal regulation compared. The basis of rates; relative rates; rates and service. Different theories of valuation. GRAY.

*191. PUBLIC FINANCE. Public expenditures; public debt; budgetary legislation; tax systems. BLAKEY.

*192. STATE AND LOCAL TAXATION. Problems of state and local taxation. Historic survey of various taxes and examination of present pro-

cedure in taxing different kinds of property; tax reforms. Particular attention given to conditions in Minnesota. BLAKEY.

### ECONOMIC REFORMS

*161. LABOR PROBLEMS. Modern labor problems: woman and child labor, industrial education, unemployment, poverty, industrial hygiene, welfare work, profit-sharing, coöperation, labor unions, strikes, boycotts, conciliation, and arbitration; economic causes and effects of immigration. CROSGRAVE.

*163. ECONOMIC CONDITIONS IN AMERICAN CITIES. The causes of economic dependence in American cities; the standard of living; the constructive agencies for economic betterment. Lectures, assigned readings, and visits of inspection in the Twin Cities. Not given in 1916-17. CROSGRAVE.

*164. THE ECONOMIC FUNCTIONS OF THE STATE. The proper limits of state interference with private property, freedom of contract and individual liberty. Police powers of the state. Legislation concerning factories, female and child labor, minimum wage, social insurance, etc. CROSGRAVE.

*165. HISTORY AND THEORY OF SOCIALISM. Economic utopias from Plato to Proudhon. Special attention to the theory, history, and practical significance of modern socialism. Lectures, assigned readings, and discussions. CROSGRAVE.

*166. TRADE UNIONISM AND ALLIED PROBLEMS. Development and activities of American trade unions. Economic and legal aspects of collective bargaining, closed shops, strikes, and boycotts. Employer's associations. Conciliation and arbitration. Social significance and probable future of trade unionism. CROSGRAVE.

*168. WAGES. The history of real and money wages during the last four centuries. Theories of wages from Adam Smith to the present. Wage statistics. Wage regulation with intensive study of minimum wage laws. Not given in 1916-17. CROSGRAVE.

## EDUCATION

### THE COLLEGE OF EDUCATION

Professors LOTUS D. COFFMAN, MELVIN E. HAGGERTY, ALBERT W. RANKIN, FLETCHER H. SWIFT; Assistant Professor WILFRED S. MILLER; Instructors JAMES W. NORMAN, WILLIAM D. REEVE.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* eighteen credits, including Philosophy 1-2, or equivalent.

*For a Major,* twenty-four credits, including Philosophy 1-2, or equivalent. Six credits in Psychology are prerequisite for all courses in Education.

## COURSES

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 1a | 3 | Brief Course in History of Education ..... | Jr., sr. | Phil. 1-2 |
| | | 8 TThS | 205Ed | Swift, Norman |
| | | 9 TThS | 205Ed | Swift, Norman |
| | | 8 MWF | 205Ed | Swift, Norman |
| 1b | 3 | Brief Course in History of Education ..... | Jr., sr. | Phil. 1-2 |
| | | 9 TThS | 205Ed | Swift, Norman |
| | | 10:45 TThS | Col. of Ag. | Norman |
| 3a | 3 | Social Aspects of Educ... | Jr., sr. | Phil. 1-2 |
| | | 4 MWF | 204Ed | ..... |
| 3b | 3 | Social Aspects of Educ... | Jr., sr. | Phil. 1-2 |
| | | 8 MWF | 204Ed | Rankin |
| 3bt | 3 | Social Aspects of Educ... | Teachers | Phil. 1-2 |
| | | 8-9:50 S | 206Ed | Rankin |
| 11a | 3 | Technique of Teaching... | Jr., sr. | Phil. 1-2 |
| | | 8 MWF | 206Ed | Haggerty |
| | | 9 MWF | 206Ed | Coffman |
| 11b | 3 | Technique of Teaching... | Jr., sr. | Phil. 1-2 |
| | | 9 MWF | 205Ed | Norman |
| *101 | 3 | Historical Foundations of Modern Education .... | Jr., sr., grad. | Phil. 1-2 and 6 cred. in Dept. of History |
| | | 4-5:30 TTh | 205Ed | Swift |
| *102 | 3 | History of Education since Reformation ..... | Jr., sr., grad. | Phil. 1-2 and 6 cred. in Dept. of History |
| | | 4-5:30 TTh | 205Ed | Swift |
| *103 | 2 | Educational Classics ..... | Jr., sr., grad. | 1 or 101-102 |
| | | 3 TTh | 205Ed | Swift, Norman |
| *104 | 2 | Educational Classics ..... | Jr., sr., grad. | 1 or 101-102 |
| | | 3 TTh | 205Ed | Swift, Norman |
| *105 | 3 | Educational Psychology... | Sr., grad. | Phil. 1-2 |
| | | 11 MWF | 206Ed | Haggerty |
| *106 | 3 | Educational Psychology... | Sr., grad. | Phil. 1-2 |
| | | 11 MWF | 206Ed | Haggerty |
| *109 | 2 | Educational Diagnosis ... | Sr., grad. | 1 or 101-102 and 3 |
| | | 10-11:40 S | 206Ed | Haggerty |
| *115a | 3 | Practice Teaching ..... | Sr., grad. | See statement |
| | | Ar Ar | Ar | Miller |
| *115b | 3 | Practice Teaching ..... | Sr., grad. | See statement |
| | | Ar Ar | Ar | Miller |
| *119 | 3 | School Curricula ..... | Sr., grad. | 1 or 101-102 and 3 |
| | | 4 MWF | 206Ed | Rankin |
| *121a | 3 | School Organ. & Admin.. | Sr., grad. | 1 or 101-102 and 3 |
| | | 3 MWF | 206Ed | Rankin |
| *121b | 3 | School Organ. & Admin.. | Sr., grad. | 1 or 101-102 and 3 |
| | | 2 MWF | 206Ed | Rankin |
| *123 | 3 | Theory of Supervision ... | Sr., grad. | 1 or 101-102 and 3 |
| | | 11 MWF | 205Ed | Coffman |
| *124 | 3 | Educational Administrn... | Sr., grad. | 121 |
| | | 3 MWF | 111Ed | Coffman |
| *125 | 3 | Methods in Ed. Research. | Sr., grad. | 1 or 101-102 and 3 |
| | | 3 MW | 111Ed | Coffman |
| *131 | 3 | German Schools ..... | Sr., grad. | 1 or 101-102 and 3 |
| | | 10 TThS | 205Ed | Norman |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *132 | 3 | French Schools ..... | Sr., grad. | 1 or 101-102 and 3 |
| | | 10 TThS | 205Ed Norman | |
| *134 | 2 | Mental Diagnosis ..... | Sr., grad. | Phil. 1-2 |
| | | 10-11:40 S | 206Ed Haggerty | |
| *136 | 3 | Mental Tests ..... | Jr., sr., grad. | Phil. 1-2 |
| | | 2-4 MWF | 202Ed Haggerty | |
| *141 | 3 | School Sanitation and Public Health ..... | Sr., grad. | 1 or 101-102 and 3 |
| | | 8 MWF | 204Ed Rankin | |
| *142 | 3 | Industrial Education .... | Sr., grad. | 1 or 101-102 and 3 |
| | | 4 MWF | 206Ed Rankin | |
| *146 | 3 | History and Principles of Religious Education ... | Jr., sr., grad. | Phil. 1-2 |
| | | 4 MWF | 205Ed Swift | |
| *201-202 | 2 | Seminar in Selected Problems in Educ. History.. | Grad. | 101-102 and 6 cred. in Dept. of History |
| | | 4-5:30 W | 214Ed Swift | |
| *203-204 | 2 | Seminar in Educational Psychology ..... | Grad. | 105 |
| | | 4-5:30 M | 207Ed Haggerty | |
| *205-206 | 2 | Seminar in Educational Administration ..... | Grad. | 124, 125, 126 |
| | | 4-5:30 W | 203Ed Coffman | |

1a,b. A Brief Course in the History of Education. Current school problems and educational theories in the light of their history. Emphasis upon secondary education and those aspects of education of most immediate concern to high-school teachers. Swift, Norman.

3a,b. Social Aspects of Education. The school as a community factor; the present peculiar relation of the school to social problems; the function of the school in these relations. Rankin.

3bt. Same as Above for Teachers.

11a,b. Technique of Teaching. Types of classroom exercises; preparation of teaching plans; hygiene of instruction; classroom management; the professional ethics of teaching; observation of high-school work. Coffman, Haggerty.

*101. Foundations of Modern Education. Interpretative historical study of those elements in modern education derived from the Hebrews, Greeks, Romans, Middle Ages, and Renaissance. Emphasis upon secondary and higher education and the origin and results of the monopoly of the cultural conception of education and cultural studies. Swift.

*102. History of Education from the Reformation to the Present Time. Modern educational institutions, theories, and problems in the light of their history. Special emphasis upon elementary education. Swift.

*103. Educational Classics. An intensive study of selected writings of educational leaders, ancient, medieval and Renaissance. Swift.

*104. EDUCATIONAL CLASSICS. An intensive study of selected writings of educational leaders from Locke to the present time. SWIFT.

*105. EDUCATIONAL PSYCHOLOGY. Advanced work in genetic psychology, the origin and nature of the human organism, the origin, development and control of instincts, the relation of instincts to the formation of habits, introductory to the psychology of learning. HAGGERTY.

*106. EDUCATIONAL PSYCHOLOGY. Psychology of learning. Methods of measuring rate of learning; study of typical learning experiments and examination of the conditions of the most economic learning, study of individual differences, and psychology of the school subjects. HAGGERTY.

*109. EDUCATIONAL DIAGNOSIS. A study of educational scales and standard tests for the measurement of efficiency in school subjects. The dard tests for the measurement of efficiency in school subjects. The course will deal with the nature of the tests, the methods of their use and an analysis of results obtained. HAGGERTY.

*115a,b. PRACTICE TEACHING. Teaching under supervision in the University High School and in the Minneapolis City Schools, in the regular secondary school subjects. The course calls for one period daily at the school where the work is assigned. MILLER.

*119. SCHOOL CURRICULA. The curriculum as related to social, industrial, and economic conditions; a survey of the grammar grades and of the high school. Consideration of the possibilities of developing a curriculum better adapted to community needs. RANKIN.

*121a,b. SCHOOL ORGANIZATION AND ADMINISTRATION. An introductory course in school administration for students of teaching experience and for those looking forward to work as principals and superintendents. RANKIN.

*123. THEORY OF SUPERVISION. The problems involved in the training of teachers in service; studies of qualities of merit in teachers; factors in service; factors in selecting teachers; the distribution of subject matter by grades; the time allotment of studies. COFFMAN, .....

*124. EDUCATIONAL ADMINISTRATION. The interpretation of present tendencies in the administration of state and city school systems. COFFMAN, .....

*125. METHODS IN EDUCATIONAL RESEARCH. A study of statistical and other methods as applied to educational investigation. This course is ordinarily required of all candidates for advanced degrees. COFFMAN.

*131. GERMAN SCHOOLS. Study of the existing school systems of Germany and with emphasis upon present conditions and problems. NORMAN.

*132. FRENCH SCHOOLS. A study of the existing school systems of France with emphasis upon present conditions and problems. NORMAN.

*134. MENTAL DIAGNOSIS OF SCHOOL CHILDREN. A study of mental variation in children, its nature, degree, causes and effects and a discussion of methods of treating superior and subnormal individuals in the schools. HAGGERTY.

*136. MENTAL TESTS. Study of individual differences by means of mental tests. Laboratory work in giving and taking tests introductory to the use of group tests for the measurement of age-level, etc. HAGGERTY.

*141. SCHOOL SANITATION AND PUBLIC HEALTH. A course in school hygiene in its broader aspects. Designed for all teachers and supervisors who are responsible for the health of school children. Treats of medical supervision and other problems arising from school environment. RANKIN.

*142. INDUSTRIAL EDUCATION. Existing types of industrial and vocational schools and systems of training. Comparison of conditions in American and foreign countries. Organization of course of study. RANKIN.

*146. HISTORY AND PRINCIPLES OF RELIGIOUS EDUCATION. Part I: The influence of religion and religious education as social and spiritual forces among certain selected types. Part II: Principles of education as applied to religious instruction and training. SWIFT.

## ENGLISH

Professors RICHARD BURTON, HARDIN CRAIG, FREDERICK KLAEBER, ELMER E. STOLL*, CARLETON BROWN; Associate Professor OSCAR W. FIRKINS; Assistant Professors JOSEPH W. BEACH, GEORGE N. NORTHROP.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, including Course 1-2.

*For a Major,* twenty-four credits, including Course 1-2, 3, 5, 8, 55.

*For B.A. with Honors,* the general requirements (page 24), a major in English, a reading knowledge of French, German, Italian, Greek, or Latin, and a final year's work in seminar for which a sequence shall have been specially arranged.

*For a Teacher's Certificate*

a. English as the major subject of teaching:
   Rhetoric 1-2, either 11-12 or 15-16, and 41-42; English 1-2, and six additional hours, at least three hours of which shall be in courses numbered above 100.

b. English as the minor subject of teaching:
   Rhetoric 1-2, and either 11-12 or 15-16; English 1-2, and at least three additional hours.

In order to be recommended, a student must secure an average of at

* Absent on leave, 1916-17.

least one and one-half honor points for each credit hour of all the work taken in the departments of English and Rhetoric.

## COURSES

| No. | Credits | Title | Offered to | Prerequisite Courses |
|---|---|---|---|---|
| 1-2 | 6 | General Survey Eng. Lit.. | Soph., jr., sr. | Rhet. 1-2 |
| | | 11 MWF | 204F ¶ | |
| | | 11 MWF | 124F ¶ | |
| | | 11 MWF | 125F ¶ | |
| | | 11 MWF | 205F ¶ | |
| | | 3 MWF | 301F ¶ | |
| | | 3 MWF | 204F ¶ | |
| | | 3 MWF | 110F ¶ | |
| | | 3 MWF | 205F ¶ | |
| 3 | 3 | Old English ..... | Soph., jr., sr. | None |
| | | 9 TThS | 205F Klaeber | |
| | | 10 TThS | 204F Firkins | |
| 4 | 3 | Advanced Old English... | Soph., jr., sr. | 3 |
| | | 9 TThS | 205F Klaeber | |
| 5a | 3 | Chaucer ..... | Soph., jr., sr. | 1-2 |
| | | 2 MWF | 204F Brown | |
| 5b | 3 | Chaucer ..... | Soph., jr., sr. | 1-2 |
| | | 10 TThS | 204F Firkins | |
| 6 | 3 | Spenser ..... | Soph., jr., sr. | 1-2 |
| | | 2 MWF | 110F Firkins | |
| 8 | 1 | Hist. of English Language | Jr., sr. | 3 |
| | | 3 T | 206F Klaeber | |
| *55a | 3 | Shakespeare ..... | Jr., sr. | 1-2 |
| | | 10 MWF | 204F Northrop | |
| *55b | 3 | Shakespeare ..... | Jr., sr. | 1-2 |
| | | 9 TThS | 204F Brown | |
| *59 | 3 | Modern Drama ..... | Sr. | 1-2, 55 |
| | | 11 MWF | 301F Burton | |
| *60 | 3 | Advanced Modern Drama | Sr. | 1-2, 55, 59 |
| | | 11 MWF | 301F Burton | |
| *62 | 3 | Milton ..... | Jr., sr. | 1-2 |
| | | See statement | | |
| *66 | 3 | Browning-Tennyson ..... | Jr., sr. | 1-2 |
| | | 10 MWF | 301F Burton | |
| *67 | 3 | English Novel ..... | Jr., sr. | 1-2 |
| | | 10 MWF | 301F Burton | |
| *75 | 2 | Recent English Poetry ... | Jr., sr. | See statement |
| | | See statement | | |
| *80a | 3‡ | Teachers' Course ..... | Jr., sr. | See statement |
| | | 3-4:30 WF | 113Ed Inglis | |
| *80b | 3‡ | Teachers' Course ..... | Jr., sr. | See statement |
| | | 3-4:30 WF | 113Ed Inglis | |
| *101 | 2 | Middle English ..... | Jr., sr., grad. | 1-2 and 3 or 3 and 4 |
| | | 3 TTh | 205F Klaeber | |
| *103 | 2 | Piers the Plowman ..... | Jr., sr., grad. | 1-2 and 3 or 3 and 4 |
| | | See statement | | |
| *105 | 3 | 18th Century Poetry ..... | Jr., sr., grad. | 1-2 |
| | | 9 MWF | 204F Craig | |
| *107 | 3 | 18th Century Prose ..... | Jr., sr., grad. | 1-2 |
| | | See statement | | |

‡ Carries credit only in the Department of Education.

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *108 | 3 | Romantic Movement ..... 9 MWF | Jr., sr., grad. 204F Craig | 1-2 |
| *109-110 | 6 | English Humorists ..... See statement | Jr., sr., grad. | 1-2 |
| *112 | 3 | 17th Century Prose ..... 10 MWF | Jr., sr., grad. 204F Northrop | 1-2 |
| *113-114 | 6 | Drama ..... 3 MWF | Sr., grad. 206F Firkins | 12 credits |
| *115 | 2 | English Idiom ..... 11 TTh | Jr., sr., grad. 301F Burton | 1-2, 3 |
| *118 | 2 | Bible as Literature ..... See statement | Jr., sr., grad. | 1-2 |
| *119-120 | 6† | Principles of Literary Criticism ..... 11 TThS | Jr., sr., grad. 204F Firkins | 1-2 |
| *122 | 3 | American Literature .... See statement | Jr., sr., grad. | 1-2 |
| *123-124 | 4 | Seminar in Novelists .... 2-3 T | Sr., grad. 110F Beach | See statement |
| *125-126 | 4 | Biography ..... 4-5 T | Sr., grad. 110F Northrop | See statement |
| *128 | 3 | 17th Century Drama .... See statement | Jr., sr., grad. | 55 or 131 |
| *131 | 3 | Elizabethan Drama ..... See statement | Jr., sr., grad. | 55 |
| *133 | 2 | English and Scottish Popular Ballads ..... 9 TTh | Jr., sr., grad. 204F Brown | 1-2 |
| *136 | 3 | Advanced Shakespeare .. 11 TTh | Jr., sr., grad. 301F Burton | 55a or 55b |
| *138 | 2 | History of Criticism ..... See statement | Jr., sr., grad. | 12 hours |
| *140 | 2 | Advanced Chaucer ..... 2 MW | Jr., sr., grad. 204F Brown | 1-2, 5a or 5b |
| *141 | 2 | Historical Grammar of English ..... 2 TTh | Jr., sr., grad. 205F Klaeber | 1-2 and 3 |
| *142 | 2 | Advanced Historical Grammar of English ... 2 TTh | Jr., sr., grad. 205F Klaeber | 1-2, 3, 141 |

† Both semesters must be completed before credit is given for the first semester.

1-2. General Survey of English Literature from the beginning to Swinburne. Lectures, recitations, and assigned readings. Designed to prepare for more minute study of special periods. These courses may be taken in either order and credited independently of each other. Craig, Brown, Beach, Northrop, et al.

3. Old English. The language, with reading of representative selections of Old English prose and poetry. The relation to modern English is particularly emphasized. Klaeber, Firkins.

4. Advanced Old English. A continuation of the preceding course. Klaeber.

5a,b. Chaucer. The grammar and literary forms of fourteenth-century English, with selected readings from Chaucer's works. Special at-

tention to *The Canterbury Tales*. Open to students who have taken or are taking Course 1-2. First semester, BROWN; second semester, FIRKINS.

6. SPENSER. The forms and literary influences in the Elizabethan period illustrated in the poetry of Edmund Spenser, with brief readings from the minor poems and extended study of *The Faerie Queene*. Open to students who have taken or are taking Course 1-2. FIRKINS.

8. HISTORY OF THE ENGLISH LANGUAGE. Outlines of the history of the language. Lectures and assigned readings. KLAEBER.

*55a,b. SHAKESPEARE. An introductory study of Shakespeare's development as a poet and dramatist up to *King Lear*, with reading of representative plays. First semester, NORTHROP; second semester, BROWN.

*59. MODERN DRAMA. Contemporary drama from 1870 to the present; the new impulse in dramatic literature under the stimulus of latter-day thought. BURTON.

*60. ADVANCED MODERN DRAMA. A continuation of the preceding course treating in greater detail contemporary problems in stagecraft and dramaturgy. Limited to twenty students who have completed Course 59 with distinction. BURTON.

*62. MILTON. The principal poets of the time of Charles I and the Protectorate with special emphasis upon Milton. Not offered in 1916-17. NORTHROP.

*66. BROWNING AND TENNYSON. A reading of the representative work of the two major poets of the Victorian era, in order to show their quality and contrasted power. BURTON.

*67. THE ENGLISH NOVEL. Principles and personalities in the evolution of the English novel. Written reports on selected novels. BURTON.

*75. RECENT ENGLISH POETRY. Poetry in England and America since 1870. The main poetic traditions and tendencies now prevailing. Not offered in 1916-17. BEACH.

*80a,b. TEACHERS' COURSE. Methods of teaching English in high schools. Course of study, textbooks, and equipment; visits to Minneapolis and St. Paul high schools; theme-correcting. Open to juniors, seniors, and graduates qualifying for Practice Teaching. Credit only in Education. INGLIS.

*101. INTRODUCTION TO MIDDLE ENGLISH. An outline of Middle English grammar, including the interpretation of selected texts. Alternates with Course 103. Not offered in 1916-17. KLAEBER.

*103. PIERS THE PLOWMAN. A critical study of *Piers the Plowman*. Alternates with Course 101. Not offered in 1916-17. KLAEBER.

*105. EIGHTEENTH CENTURY POETRY. The Rise of Naturalism and Romanticism. Eighteenth century English poetry from Pope to Burns, with

special reference to the rise and growth of naturalism and romanticism. CRAIG.

*107. EIGHTEENTH CENTURY PROSE. Lectures on eighteenth century prose and prose writers; readings by the students and essays on approved topics; special study of fiction and the essay. Not offered in 1916-17. CRAIG.

*108. THE ROMANTIC MOVEMENT. The Romantic School of poets from Wordsworth to Keats and the influence of the revolution in France. CRAIG.

*109-110. ENGLISH HUMORISTS. Manifestations of the comic spirit in modern English literature; humor, wit, comedy, and satire, with special reference to their use in a criticism of life; illustrations from dramatists, novelists, essayists, poets. Not offered in 1916-17. BEACH.

*112. SEVENTEENTH CENTURY PROSE. General survey of the prose of the century to 1660. Second semester. Course 3-4 in History is a desirable prerequisite. NORTHROP.

*113-114. THE DRAMA: STRUCTURE AND EVOLUTION. First semester: theory of the drama, and history up to the nineteenth century. Second semester: recent drama, continental, English; open only to those who have completed first semester. FIRKINS.

*115. ENGLISH IDIOM. A discussion of current idiom with the purpose of relating it to the underlying principles of historic development. BURTON.

*118. THE BIBLE AS LITERATURE. A literary study of the Old Testament with special attention to forms and the critical study of selected readings. Not offered in 1916-17. BURTON.

*119-120. PRINCIPLES OF LITERARY CRITICISM. A brief treatment of elements or forces in literature; an exposition of literary types in relation to the standards and methods of judging each. Instructor's permission to take the course must be obtained before registration. FIRKINS.

*122. AMERICAN LITERATURE. Lectures on American literature, with extensive readings from the principal poets and prose writers of the United States. Not offered in 1916-17. CRAIG.

*123-124. SEMINAR IN NOVELISTS. Detailed study of selected novelists. In 1916-17, George Meredith; in 1917-18, Henry James first semester, Thomas Hardy second semester. Open upon approval of instructor to graduate students and seniors who have completed twelve credits in English. BEACH.

*125-126. BIOGRAPHY. The rise and development of English biography, with attention to journals, memoirs, and letters. Open to graduates with a major in English or History and, upon approval of the instructor, to seniors with twelve credits in English. NORTHROP.

*128. SEVENTEENTH CENTURY DRAMA. The drama from the Restoration to the rise of sentimental comedy, special attention being given to the Comedy of Manners, from Etherege to Farquhar. Not offered in 1916-17. STOLL.

*131. ELIZABETHAN DRAMA. A study of Elizabethan and Jacobean dramatists (Shakespeare not included) from Lyly to Shirley. Not offered in 1916-17. STOLL.

*133. THE ENGLISH AND SCOTTISH POPULAR BALLADS. A study of a large number of traditional ballads, English and foreign, and an examination of ballad style and origins. BROWN.

*136. ADVANCED SHAKESPEARE. Shakespeare's development traced to the end. A careful analysis of a number of the later plays. Problems in the interpretation of Shakespeare's dramatic methods. BURTON.

*138. HISTORY OF CRITICISM. This course traces the rise, growth and present status of principles of English literary criticism. Open upon approval of instructor to graduate students and seniors who have completed twelve credits in English. Not offered in 1916-17. BURTON.

*140. ADVANCED STUDY OF CHAUCER. Further study of *The Canterbury Tales* and of the Minor Poems. Open upon approval of instructor to juniors, seniors, and graduate students who have completed 5a or 5b. BROWN.

*141. HISTORICAL GRAMMAR OF THE ENGLISH LANGUAGE, I. Sounds and spelling. This course is identical with Comparative Philology 141.

*142. HISTORICAL GRAMMAR OF THE ENGLISH LANGUAGE, II. Accidence and Syntax. This course is identical with Comparative Philology 142.

## GEOLOGY AND MINERALOGY

Professor WILLIAM H. EMMONS; Associate Professor CLINTON R. STAUFFER; Assistant Professors FRANK F. GROUT, CHESSLEY J. POSEY; Instructors THOMAS M. BRODERICK, A. WALFRED JOHNSTON, TERENCE T. QUIRKE; in the General Extension Division, Assistant Professor *EDWARD M. LEHNERTS.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits. It is strongly recommended that a field course be included when this is practicable.

*For B.A. with Honors,* Courses 11, 29, 105, 111, 124, and a field course; and twelve credits selected from the following courses:

57, 58, 108, 109 in Paleontology
106, 131, 132, 140 in Petrology
112, 124, 137, 140, 144 in Economic Geology
106, 112, 124 in Structural Geology
36, 39, 116, 118 in Geography

* Absent on leave, 1916-17.

*For a Teacher's Certificate,* requirements the same as for a major, with an average of at least one and one-half honor points for each credit hour.

## COURSES

| No. | Credits | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1 | 3† | General Geology ..... | | Soph., jr., sr. | | None |
| | | 8 | MWF | 105P | Johnston | |
| | | 10 | TThS | 110P | Emmons | |
| | | 11 | MWF | 110P | Johnston | |
| | | 3 | MWF | 110P | Johnston | |
| 3 | 1 | General Geology Laboratory | | Soph., jr., sr. | | Supports 1 |
| | | Ar. | | 112P | Johnston | |
| 4 | 3 | Geology of Minnesota..... | | Soph., jr., sr. | | Course 1 |
| | | 11 | MWF | 110P | Johnston | |
| *5 | 3 | Economic Geology ..... | | Jr., sr. | | 1 and 6 |
| | | 9 | MWF | 104P | Quirke | |
| 6 | 3† | Historical Geology ..... | | Soph., jr., sr. | | Course 1 |
| | | 10 | TThS | 110P | Emmons | |
| | | 11 | TThS | 105P | Quirke | |
| | | 3 | MWF | 105P | Quirke | |
| 8 | 1 | Historical Geology Laborat. | | Soph., jr., sr. | | Supports 4 and 6 |
| | | Ar. | | 112P | Johnston | |
| 10 | 3 | Elements of Paleontology.. | | Soph., jr., sr. | | Course 1 |
| | | 10 | MWF | 104P | Stauffer | |
| 11 | 3 | Paleontology ..... | | Jr., sr. | | Course 6 |
| | | Lect. 9 | M | 104P | Stauffer | |
| | | Lab. 2-4 | WF | 104P | Stauffer | |
| 12 | 3 | Paleontology ..... | | Jr., sr. | | Course 11 |
| | | Lab. 9 | M | 104P | Stauffer | |
| | | Lab. 2-4 | WF | 104P | Stauffer | |
| 14 | 3 | Applied Geol. for Civ. Eng. | | Soph., jr., sr. | | Course 1 |
| | | 8 | TThS | 110P | Quirke | |
| 15a or 15b | 1 | Minerals and Rocks ..... | | Jr., sr. | | 1 |
| | | Ar. | | 112P | Grout | |
| 21 | 3 | Elements of Mineralogy ... | | Soph., jr., sr. | | See statement |
| | | Lect. 11 | TThS | 110P | Broderick | |
| | | Lab. 8 | TThS | 100P | Broderick | |
| | | Lab. 10 | TThS | 100P | Broderick | |
| | | Lab. 2-5 | W | 100P | Broderick | |
| 22 | 3 | Descriptive Mineralogy .... | | Soph., jr., sr. | | 21 |
| | | Lect. 11 | TThS | 110P | Broderick | |
| | | Lab. 10 | TThS | 100P | Broderick | |
| 27a or 27b | 1 | Outlines of Mineralogy ... | | Jr., sr. | | None |
| | | Ar. | | 100P | Grout | |
| 29 | 3 | General Physiography ..... | | Soph., jr., sr. | | None |
| | | 10 | TThS | 105P | Posey | |
| 34 | 3 | Meteorology ..... | | Soph., jr., sr. | | None |
| | | 8 | TThS | 105P | Posey | |
| 35 | 1 | Laboratory work ..... | | Soph., jr., sr. | | See statement |
| | | Ar. | | Ar.P | Posey | |
| 36 | 3 | Geog. of North America.... | | Soph., jr., sr. | | 1 or 29 |
| | | 10 | TThS | 105P | Posey | |
| 37 | 3 | Physical & Commer. Geog.. | | Freshmen | | None |
| | | 9 | MWF | 110P | Posey | |

† Geology 1 and 6 constitute a year's course; both semesters must be completed before credit is given for the first semester.

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 39 | 3 | Geographic Influences ..... | Soph., jr., sr. | See statement |
| | | 10 MWF | 105P Posey | |
| *55 | 2 | Teachers' course in Geog... | Jr., sr., grad. | See statement |
| | | 8 ThS | 105P Posey | |
| *57 | 3 | Paleontology ..... | Jr., sr. | 6 |
| | | 9-11 TThS | 104P Stauffer | |
| *58 | 3 | Paleontology ..... | Jr., sr. | 57 |
| | | 9-11 TThS | 104P Stauffer | |
| *61 | 3 | Physical Mineralogy ..... | Jr., sr. | 22 |
| | | Ar. | Ar.P Grout | |
| *65 | 3 | Morphology of Minerals .. | Jr., sr. | 22 |
| | | Ar. | Ar.P Grout | |
| *105 | 3 | Elements of Rock Study.... | Jr., sr., grad. | See statement |
| | | 2-4 TTh | 112P Grout | |
| *106 | 3 | Petrology ..... | Jr., sr., grad. | 105 |
| | | 2-4 TTh | 112P Grout | |
| *108 | 3 | Paleontologic Practice .... | Jr., sr., grad. | 58 |
| | | 2-4 MWF | 107P Stauffer | |
| *109 | 3 | Advanced Paleonthology ... | Jr., sr., grad. | 58 |
| | | 8-10 MWF | 107P Stauffer | |
| *110 | 3 | Advanced Paleontology ... | Jr., sr., grad. | 109 |
| | | 8-10 MWF | 107P Stauffer | |
| *111 | 4 | Ore Deposits ..... | Sr., grad. | 6, 22, 105 |
| | | 8 TWThF | 110P Emmons | |
| *112 | 4 | Problems in Ore Deposits.. | Sr., grad. | 111 |
| | | 2-6 W | 104P Emmons | |
| *116 | 3 | Geog. of Latin America.... | Jr., sr., grad. | 1, 29 or 31-32 and 3 |
| | | 9 MWF | 105P Posey | credits in Geog. |
| *118 | 3 | Geography of Eurasia..... | Jr., sr., grad. | Same as for 116 |
| | | 9 MWF | 105P Posey | |
| *124 | 3 | Structural & Metam. Geol.. | Sr., grad. | 6, 22, 105 |
| | | 10 TThS | 112P Johnston | |
| *131-*132 | 6 | Advanced Petrology ..... | Jr., sr., grad. | 106 |
| | | 9-11 W | 112P Grout | |
| *137 | 3 | Testing Economic Minerals | Jr., sr., grad. | 6, 22, 105 |
| | | Lect. 11 MW | 100P Grout | |
| | | Lab. 2-4 W | 100P Grout | |
| *140 | 3 | Applied Petrology ..... | Jr., sr., grad. | See statement |
| | | 2-4 TTh | 112P Grout | |
| *144 | 3 | Construction of Geol. Maps | Jr., sr., grad. | 1, 6 |
| | | Ar. | 112P Quirke | |
| *151 | 3 | Advanced General Geology. | Jr., sr., grad. | 6 |
| | | 11 MWF | 104P Stauffer | |
| *152 | 3 | Advanced General Geology. | Jr., sr., grad. | 151 |
| | | 11 MWF | 104P Stauffer | |
| *160 | 6 | Field Geology ..... | Jr., sr., grad. | See statement |
| *188 | 6 | Field Work in Geography.. | Jr., sr., grad. | See statement |

1. General Geology. A synoptical treatment of materials of the earth and of geologic processes. Physiographic, dynamic, and structural geology, with a brief introduction to historical geology. Lectures, laboratory work, field excursions, map study, and conferences. Emmons, Johnston.

3. Laboratory Work. Supplements Course 1 with study of rocks and ores, topographic and geologic maps, and reference reading. Johnston and Assistants.

4. GEOLOGY OF MINNESOTA. The physical geography and geologic history of Minnesota. The relations of industrial development to geological features. The principles of pre-Cambrian geology as exemplified in Minnesota. JOHNSTON.

*5. ECONOMIC GEOLOGY. The mineral resources of the United States. The origin, distribution, and uses of the important minerals and mineral fuels. Lectures, map work, conferences, and field excursions. QUIRKE.

6. HISTORICAL GEOLOGY. The geological history of the North American continent; the more important types of fossils and their relations. EMMONS, QUIRKE.

8. HISTORICAL GEOLOGY LABORATORY WORK. The interpretation of geologic maps and sections; structural relations; study of fossils and rock specimens. JOHNSTON, QUIRKE.

10. ELEMENTS OF PALEONTOLOGY. An introduction to the study of fossil organisms. Lectures supplemented by field excursions. This course may be taken with Course 6. STAUFFER.

11. PALEONTOLOGY. Index fossils of North America; a study of fossils and their uses in correlation. A course intended primarily for mining geologists. STAUFFER.

12. PALEONTOLOGY. A continuation of Course 11.

14. APPLIED GEOLOGY FOR CIVIL ENGINEERS. Occurrence, properties, production, and uses of building stones, cements, clays, fuels, and road metals. A brief introduction to the study of ore deposits and historical geology. QUIRKE.

15a or 15b. MINERALS AND ROCKS. An outline study of general principles of petrography: classification of minerals and rocks and practice in their identification. GROUT.

21. ELEMENTS OF MINERALOGY. The crystal systems; morphological, physical, and chemical character of minerals; occurrence, genesis, and uses of minerals; classification and description of common minerals. Determinative work in laboratory, blowpipe analysis, sight identification. Open to students who have taken or are taking Chemistry. BRODERICK.

22. DESCRIPTIVE MINERALOGY. Continues Course 21. Special attention given to metalliferous and rock-forming minerals. Laboratory determinations and sight identification. The use of the goniometer and microscope. Laboratory work, reference reading, and field excursions. BRODERICK.

27a,b. OUTLINES OF MINERALOGY. A course designed especially for teachers. Methods of identification of minerals, laboratory practice, conferences, reference reading. GROUT.

29. GENERAL PHYSIOGRAPHY. Principles of earth sculpture; physiographic changes in progress, and agencies causing them; hydrography and

oceanography; planetary relations; climatology; field excursions. POSEY.

31-32. PHYSICAL AND HUMAN GEOGRAPHY. Physical features of the earth; elements of climatology and oceanography; economic and political development in relation to nature; geographic and economic interpretations of history; economic progress as adaptation to environment. Not offered in 1916-17. POSEY, MCFALL.

34. METEOROLOGY. The properties and phenomena of the atmosphere, including composition, temperature, pressure, and circulation; the work of the Weather Bureau; the major climatic divisions of the earth and their climates. POSEY.

35. LABORATORY WORK. A course in the interpretation of topographic maps. Supplements and should accompany Courses 29 and 31, though not required in connection with them. Should be taken by those who are preparing to teach Physiography.

36. GEOGRAPHY OF NORTH AMERICA. The regional geography of the United States and Canada; their physiography, climate, natural resources, and people. The utilization and conservation of natural resources emphasized. May be taken as a continuation of Course 29. POSEY.

37. PHYSICAL AND COMMERCIAL GEOGRAPHY. A study of the origin of the earth's physical features, of the distribution of natural resources, and of the geographic factors influencing the production and exchange of commodities. Required of commerce students. POSEY.

39. GEOGRAPHICAL INFLUENCES IN THE DISCOVERY AND DEVELOPMENT OF AMERICA. A study of the influence of geographic factors of location, topography, climate, and natural resources upon the economic, social, and political development of America. Given in alternate years. Not given in 1916-17. Prerequisites Geology 1 or 29 or 31, and History 5 or its equivalent. POSEY.

*55. TEACHERS' COURSE IN GEOGRAPHY. A critical study of the materials and methods of teaching secondary school geography. The relation of human activities to environment will be emphasized. Prerequisites: Geology 1 or 29, and 36 or 116 or 118. POSEY.

*57. PALEONTOLOGY. A study of fossil forms with special reference to those of geological importance. STAUFFER.

*58. PALEONTOLOGY. Faunas and their correlation. A continuation of Course 57. STAUFFER.

*61. PHYSICAL MINERALOGY. The form, optical and physical properties of minerals; expansion and conductivity; pyro-electricity; hardness, percussion, and etch figures; cleavage and gliding planes. GROUT.

*65. MORPHOLOGY OF MINERALS. Crystallography, embracing projection and the geometric relations of crystal planes; crystal nomenclature; the relation of special properties to morphology. A study of crystal

models, crystal drawing, identification of minerals from crystal measurements, and mathematical calculation. GROUT.

*105. ELEMENTS OF ROCK STUDY. The occurrence and genesis of igneous, sedimentary, and metamorphic rocks; their mineral and chemical composition, structure, texture, and alteration. Classification and methods of identification and description of rocks. Open to students who have had Course 1 and who have taken or are taking Course 22. GROUT.

*106. PETROLOGY. 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. Laboratory work, lectures, and reference reading. GROUT.

*108. 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. Largely individual work. STAUFFER.

*109. ADVANCED PALEONTOLOGY. A systematic study of fossil organisms accompanied by an analytical study of faunas. Lectures and laboratory work. STAUFFER.

*110. ADVANCED PALEONTOLOGY. A continuation of Course 109.

*111. 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. EMMONS.

*112. PROBLEMS IN ORE DEPOSITS. Field excursions, map work, lectures on field and laboratory methods. EMMONS.

*116. GEOGRAPHY OF LATIN AMERICA. Regional geography of the Latin-American countries; their geology, topography, climate, natural resources, people. Trade relations between Latin-American countries and the United States given special attention. Alternates with Course 118. Not given in 1916-17. POSEY.

*118. GEOGRAPHY OF EURASIA. Regional geography of Eurasia; the geology, topography, climate, natural resources, people, industries, and trade of these countries. The attitude of the major European countries to the "new" lands of Asia. Alternates with Course 116. POSEY.

*124. STRUCTURAL AND METAMORPHIC GEOLOGY. The conditions, processes, and results of metamorphism; structural features resulting from deformation under varying conditions of load. JOHNSTON.

*131-*132. ADVANCED PETROLOGY. Advanced optical methods. Criteria for rapid identification of minerals and rocks. The uses of schedules and tables. Standard rock types. Regional and genetic studies. Petrographic reports. Six credits. GROUT.

*137. TESTING ECONOMIC MINERALS. Methods of determining quality of mineral deposits, described and illustrated by laboratory tests of coals, oil, building stone, and metallic ores. GROUT.

*140. APPLIED PETROLOGY. To follow or accompany Course 132. Determination of transparent and opaque ores and gangue minerals. Microscopic studies of paragenesis of ores and other mineral associations by means of reflecting light. Practical petrographic problems. GROUT.

*144. CONSTRUCTION OF GEOLOGIC MAPS. Methods of geological examination; problems in construction and interpretation of geologic maps and sections; field practice in plane table methods of topographic and geologic mapping. QUIRKE.

*151. ADVANCED GENERAL GEOLOGY. Geologic processes and their results; development of the North American continent. STAUFFER.

*152. ADVANCED GENERAL GEOLOGY. A continuation of Course 151.

*160. FIELD GEOLOGY. Two weeks in the field in the summer vacation period. Fields for 1916, the Mesabi and Vermilion ranges. Credits given only on completion of satisfactory report. JOHNSTON.

*188. FIELD WORK IN GEOGRAPHY. A six weeks' course during the summer months. Systematic study in the field of the physical and industrial geography of selected areas in one or more western states. Arrangements made upon application to the department. LEHNERTS.

## GERMAN

Professor CARL SCHLENKER; Assistant Professors OSCAR C. BURKHARD, WALTER R. MYERS; Instructors JAMES DAVIES, LYNWOOD G. DOWNS, J. THEODORE GEISSENDOERFER, ARTHUR R. GRAVES, ALFRED E. KOENIG, HAROLD W. SOULE, RICHARD WISCHKAEMPER, EDWIN H. ZEYDEL; Teaching Fellow ARNOLD W. SHUTTER.

### REQUIREMENTS OF THE DEPARTMENT

*For a minor,* twelve credits, not including Course 1.

*For a major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 24) and fifteen credits during the junior year in courses numbered between 51 and 100, of which Courses 53-54 and 55-56 are required; eight credits during the senior year, including at least one course numbered between 101 and 200, and one course numbered above 200; and the special thesis, to be completed under the direction of the instructor in charge of the latter course.

*Teacher's Certificate in German.* For a *minor* recommendation, a minimum of fourteen credits; required courses are German 29-30, 31-32 and 59-60. For a *major* recommendation, a minimum of twenty-eight credits; required courses are German 29-30, 31-32, 53-54, 55-56 and 59-60. German 57-58 is strongly recommended. German 1 and 3 shall not be counted toward either a minor or a major recommendation. To obtain either a minor or a major recommendation the student must obtain an average of one and one-half honor points for each credit hour for all German courses taken.

For courses in Germanic Philology see the statement of the Department of Comparative Philology.

## COURSES

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 1a | 6 | Beginning ..... | | All | None |
| | | 8 | MTWThFS | 207F | ¶ |
| | | 9 | MTWThFS | 207F | ¶ |
| | | 10 | MTWThFS | 207F | ¶ |
| | | 11 | MTWThFS | 207F | ¶ |
| 1b | 6 | Beginning ..... | | All | None |
| | | 11 | MTWThFS | 209F | ¶ |
| 3a | 6 | Intermediate ..... | | All | 1a or 1b |
| | | 11 | MTWThFS | 209F | ¶ |
| 3b | 6 | Intermediate ..... | | All | 1a or 1b |
| | | 8 | MTWThFS | 207F | ¶ |
| | | 9 | MTWThFS | 207F | ¶ |
| | | 10 | MTWThFS | 207F | ¶ |
| | | 11 | MTWThFS | 207F | ¶ |
| 5a-6b | 6† | Prose and Poetry..... | | Fr., soph. | 2 yrs. prep. German |
| | | 8 | TThS | 209F | ¶ |
| | | 9 | MWF | 212F | ¶ |
| | | 10 | MWF | 209F | ¶ |
| | | 10 | TThS | 212F | ¶ |
| | | 11 | MWF | 109F | ¶ |
| | | 11 | TThS | 109F | ¶ |
| | | 2 | MWF | 213F | ¶ |
| | | 3 | MWF | 209F | ¶ |
| 5b-6a | 6† | Prose and Poetry..... | | Fr., soph. | 2 yrs. prep. German |
| | | 2 | MWF | 209F | ¶ |
| 7-8 | 6 | Drama ..... | | Fr., soph., jr., sr. | 5-6 or 4 yrs. prep. German |
| | | 9 | TThS | 212F | Burkhard |
| | | 10 | MWF | 213F | Schlenker |
| | | 11 | TThS | 212F | Davies |
| | | 3 | MWF | 207F | |
| 9-10 | 6† | Historical Prose ..... | | Fr., soph., jr., sr. | 5-6 or 4 yrs. prep. German |
| | | 9 | MWF | 205F | Geissendoerfer |
| 11-12 | 6† | Rapid Reading ..... | | Soph., jr., sr. | 3a or 3b |
| | | 9 | TThS | 110F | Koenig |
| | | 10 | TThS | 213F | Graves |
| | | 11 | MWF | 212F | Davies |
| | | 2 | MWF | 209½F | Soule |
| 21-22 | 6† | Scientific Intermediate ..... | | Fr., soph. | 3a or 3b or 2 yrs. prep. German |
| | | 11 | TThS | 213F | Geissendoerfer |
| 23-24 | 6† | Scientific Advanced ..... | | Soph., jr. | 5-6 or 21-22 |
| | | 11 | MWF | 213F | Wischkaemper |
| 25-26 | 2† | Elementary Comp. ..... | | Fr., soph., jr. | See note a below |
| | | 9 | S | 209½F | Zeydel |
| | | 10 | S | 25F | Soule |
| | | 2 | M | 207F | Wischkaemper |

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 27-28 | 2† | Elementary Convers. ..... | | Fr., soph., jr. | See note a below |
| | | 8 | WF | 209½F | Soule |
| | | 9 | TTh | 209½F | Zeydel |
| | | 10 | TTh | 5F | Downs |
| | | 2 | WF | 207F | Wischkaemper |
| 29-30 | 2† | Advanced Convers. ..... | | Soph., jr., sr. | See note b below |
| | | 9 | WF | 209½F | Koenig |
| | | 9 | WF | 107F | Zeydel |
| | | 10 | TTh | 110F | |
| | | 10 | TTh | 25F | Soule |
| 31-32 | 2† | Interm. Composition ..... | | Soph., jr., sr. | See note b below |
| | | 9 | M | 209½F | Koenig |
| | | 9 | M | 107F | Zeydel |
| | | 10 | S | 110F | |
| | | 10 | S | 209F | Wischkaemper |
| *51 | 2 | Faust, Part I ..... | | Soph., jr., sr. | 7-8 or 9-10, or 11-12, or 23-24 |
| | | 11 | WF | 209½F | Schlenker |
| *52 | 2 | Faust, Part II ..... | | Soph., jr., sr. | 51 |
| | | 11 | WF | 209½F | Schlenker |
| *53 | 3 | Survey Through Classic Per. | | Soph., jr., sr. | 7-8 or 9-10, or 11-12, or 23-24 |
| | | 9 | MWF | 209F | Burkhard |
| | | 9 | TThS | 209F | Myers |
| *54 | 3 | Survey since Classic Period. | | Soph., jr., sr. | 53 |
| | | 9 | MWF | 209F | Burkhard |
| | | 9 | TThS | 209F | Myers |
| *55-56 | 2† | Advanced Composition ..... | | Jr., sr. | 31-32 |
| | | 3 | M | 209½F | Myers |
| *57-58 | 2† | Oral Diction ..... | | Jr., sr. | See statement |
| | | 3 | WF | 209½F | Koenig |
| *59-60 | 2† | Teacher's Course ..... | | Jr., sr. | 29-30 & 31-32, or 53-54 |
| | | 4 | F | 209F | Schlenker |
| *61 | 2 | Romantic School ..... | | Jr., sr. | 7-8, or 9-10, or 11-12, or 23-24 |
| | | 11 | TTh | 209½F | Schlenker |
| *62 | 2 | Drama of Last 30 Years... | | Jr., sr. | 2 credits in starred courses |
| | | 11 | TTh | 209½F | Schlenker |
| *63 | 2 | Schiller Poetry ..... | | Jr., sr. | 7-8, or 9-10, or 11-12, or 23-24 |
| | | 10 | TTh | 209F | Wischkaemper |
| *64 | 2 | Goethe Poetry ..... | | Jr., sr. | 7-8, or 9-10, or 11-12, or 23-24 |
| | | 10 | TTh | 209F | Wischkaemper |
| *107-108 | 4† | Middle High German ..... | | Jr., sr., grad. | 4 credits in starred courses |
| | | 4 | MW | 209F | |
| *109-110 | 4† | Hist. of German Language. See statement | | Jr., sr., grad. | 4 credits in starred courses |
| *119-120 | 4† | Drama of Schiller..... | | Sr., grad. | 4 credits in starred courses |
| | | 2-4 | Th | 209F | Myers |
| *127-128 | 4† | 18th and 19th Cent. Lyric.. | | Sr., grad. | 4 credits in starred courses |
| | | 2-4 | M | | Davies |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *129-130 | 4† | Der Deutsche Roman..... See statement | Sr., grad. | 4 credits in starred courses |
| *131-132 | 4† | Die Novelle ..... 2-4 W | Sr., grad. 212F | 4 credits in starred courses Burkhard |
| *133-134 | 4† | English Influences ..... See statement | Sr., grad. | 4 credits in starred courses |
| *137-138 | 4† | Grillparzer ..... 4-6 F | Sr., grad. 206F | 4 credits in starred courses Geissendoerfer |
| *143-144 | 4† | Heine ..... 4 TTh | Sr., grad. 209F | 4 credits in starred courses Graves |
| *225-226 | 4† | Literary Problems ..... See statement | Honors and grad. | |
| *231-232 | 4† | Faust Seminar ..... 2-4 T | Honors and grad. 209F | Schlenker |

† Both semesters must be completed before credit is given for either semester.

a. Only students who are taking or who have taken Course 5-6 or Course 21-22 may elect the supplementary courses 25-26 and 27-28, either one or both together. But students electing Course 11-12 may take Course 25-26. No credit will be granted to students who are taking or have taken a course numbered above 50.

b. Only students who are taking or who have taken Course 7-8 or Course 9-10 or Course 11-12 or Course 23-24 may elect the supplementary courses 29-30 and 31-32, either one or both together. Students electing Course 11-12 should take 31-32 only after consultation with the instructor in charge.

c. Credit will be granted for either Course 5-6 or Course 21-22 but not for both.

d. Credit for only one of the following courses will be granted: courses 7-8, 9-10, 11-12, 23-24.

1a,b. BEGINNING. Double course. Pronunciation, grammar, conversation, and composition; selected readings in easy prose and verse. MYERS, DAVIES, DOWNS, GRAVES, KOENIG, SOULE, ZEYDEL, SHUTTER.

3a,b. INTERMEDIATE. Double course. Selected texts in modern narrative and descriptive prose; selected lyrics and ballads; a drama of Lessing, Goethe, or Schiller. Assigned reading of texts outside of class. MYERS, DAVIES, DOWNS, GRAVES, KOENIG, SOULE, ZEYDEL, SHUTTER.

5a-6b or 5b-6a. PROSE AND POETRY. Geography, history, and legend. Review of German grammar throughout the year. See Notes *a* and *c* above. BURKHARD, DOWNS, GEISSENDOERFER, GRAVES, SOULE, WISCHKAEMPER, ZEYDEL.

7-8. DRAMA. First semester: classic drama; plays of Lessing, Goethe, Schiller. Second semester: modern drama; plays of Hebbel, Haupt-

mann, Sudermann, and others. Assigned readings and reports throughout the year. See Notes *b* and *d* above. SCHLENKER, BURKHARD, DAVIES.

9-10. HISTORICAL PROSE. Rapid reading course for students of history and the other social sciences. See Notes *b* and *d* above. GEISSENDOERFER.

11-12. RAPID READING. First semester: narrative prose; Hauff, Storm, Sudermann, Goethe's *Hermann und Dorothea*. Second semester: plays of Lessing, Goethe, Schiller, Hebbel. Assigned readings and reports. See Notes *a*, *b*, and *d* above. DAVIES, GRAVES, KOENIG, SOULE.

21-22. SCIENTIFIC INTERMEDIATE. This course aims to give students a reading knowledge of German for use in scientific studies. See Notes *a* and *b* above. GEISSENDOERFER.

23-24. SCIENTIFIC ADVANCED. Reading of monographs and periodicals. See Notes *b* and *d* above. WISCHKAEMPER.

25-26. ELEMENTARY COMPOSITION. Translation of easy English selections; essays on assigned subjects. See Note *a* above. SOULE, WISCHKAEMPER, ZEYDEL.

27-28. ELEMENTARY CONVERSATION. Conversation on topics of every-day life, aiming at fluency in the use of idiom. Not a course in composition. Organized on the laboratory basis—one hour credit with two hours recitation and at least one hour of outside reading. See Note *a* above. DOWNS, SOULE, WISCHKAEMPER, ZEYDEL.

29-30. ADVANCED CONVERSATION. Aims to develop ease and correctness of oral expression. Organized on laboratory basis—one hour credit with two hours recitation and at least one hour of outside reading. See Note *b* above. KOENIG, SOULE, ZEYDEL.

31-32. INTERMEDIATE COMPOSITION. Translation of English selections; essays on assigned subjects; the elements of German style. See Note *b* above. KOENIG, WISCHKAEMPER, ZEYDEL.

*51. GOETHE'S FAUST, PART I. Reading and interpretation of the text; study of its genesis; the Faust legends and the early Faust books; Marlow's *Faustus*; the most important criticisms of the work. SCHLENKER.

*52. GOETHE'S FAUST, PART II. Reading and interpreting of the text; study of its genesis; the most important criticisms of the work; the treatment of the Faust legend in European literature before and since Goethe. SCHLENKER.

*53. SURVEY OF GERMAN LITERATURE THROUGH THE CLASSIC PERIOD. Lectures, assigned readings, reports. BURKHARD, MYERS.

*54. SURVEY OF GERMAN LITERATURE SINCE THE CLASSIC PERIOD. Lectures, assigned readings, reports. BURKHARD, MYERS.

*55-56. ADVANCED COMPOSITION. A discussion of the more difficult princi-

ples of structure and style; criticism of essays on assigned subjects. Such a book as Lyon's *Handbuch der Deutschen Sprache II* will be made the basis of the work. MYERS.

*57-58. ORAL DICTION. Oral exercises based upon studies in German cultural life; critical analysis of various works of German literature, argumentation and debate. Prerequisites: Courses 29-30 and 31-32, and consultation with the instructor. KOENIG.

*59-60. TEACHERS' COURSE. Lectures, readings, and reports; observation of classes. SCHLENKER.

*61. THE ROMANTIC SCHOOL. Assigned readings, reports; occasional lectures. SCHLENKER.

*62. DRAMA OF THE LAST THIRTY YEARS. Assigned readings, reports, occasional lectures. SCHLENKER.

*63. POETRY OF THE CLASSIC PERIOD. Schiller's poems. Study of metrics and form. WISCHKAEMPER.

*64. POETRY OF THE CLASSIC PERIOD. Goethe's poems. WISCHKAEMPER.

*107-108. BEGINNING MIDDLE HIGH GERMAN. Phonology, accidence, and syntax of Middle High German with reference to New High German. *Der Arme Heinrich, Nibelungenlied,* selected poems of Walther. Lectures on the epic and German life in the twelfth and thirteenth centuries. SCHLENKER.

*109-110. HISTORY OF THE GERMAN LANGUAGE. Its development, with special reference to modern German. Based on Behagel's *Deutsche Sprache*. Etymology, word formation, syntax, comparison of English and German, etc. Arranged to meet the needs of teachers. Not given in 1916-17. KLAEBER.

*119-120. THE DRAMA OF SCHILLER. The plays considered with reference to the development of the dramatic idea, from the expression of the Storm and Stress movement in the early plays to the classic form of his last works. MYERS.

*127-128. LYRIC POETRY OF THE EIGHTEENTH AND NINETEENTH CENTURIES. Historical review of the best lyric poetry and the chief writers. DAVIES.

*129-130. DER DEUTSCHE ROMAN. A study of the social forces and the foreign influences manifesting themselves in the German novel. Not given in 1916-17. GEISSENDOERFER.

*131-132. DIE NOVELLE. A study of the technique and development. Assigned readings and reports. BURKHARD.

*133-134. ENGLISH INFLUENCES IN GERMAN LITERATURE. A study of the literary relations between England and Germany with special reference to the effect upon German Literature. First semester: Milton, Pope, Richardson, and Fielding; second semester: Shakespeare. Not given in 1916-17. MYERS.

*137-138. GRILLPARZER. His life and works. Assigned readings and reports. GEISSENDOERFER.

*143-144. HEINE. His life and works. Assigned readings and reports. GRAVES.

## GREEK

Professors JOHN CORRIN HUTCHINSON, CHARLES ALBERT SAVAGE.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits (exclusive of Courses 59 to 64 inclusive).

### COURSES

| No. | Credits | Title | | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|---|
| 1-2 | 10 | First Year Greek ..... | | | Fr., soph., jr., sr. | | None |
| | | | 9 | TWThFS | 113F | ¶ | |
| | | | 11 | TWThFS | 114F | ¶ | |
| 3-4 | 6 | Anabasis—Iliad ..... | | | Fr., soph., jr., sr. | | 1-2 |
| | | | 10 | MWF | 114F | | Savage |
| 7 | 3 | Dramatic Poetry ..... | | | Soph., jr., sr. | | 3-4 |
| | | | 9 | TThS | 114F | | Savage |
| *51 | 3 | Philosophy ..... | | | Jr., sr. | | 3-4 |
| | | | 10 | TThS | 113F | | Hutchinson |
| *52 | 3 | Oratory ..... | | | Jr., sr. | | 3-4 |
| | | | 10 | TThS | 114F | | Savage |
| *53-54 | 2 | Composition ..... | | | Sr. | | 51-52 |
| | | | 3 | F | 113F | | Hutchinson |
| *101 | 3 | Lyric Poetry ..... | | | Sr., grad. | | 51 or 52 |
| | | | 10 | MWF | 113F | | Hutchinson |
| *102 | 3 | Tragedy ..... | | | Sr., grad. | | 7 or 101 |
| | | | 9 | MWF | 114F | | Savage |
| *103 | 3 | Septuagint ..... | | | Sr., grad. | | 51 |
| | | | 11 | MWF | 113F | | Hutchinson |
| *104 | 3 | New Testament ..... | | | Sr., grad. | | 51 |
| | | | 11 | MWF | 113F | | Hutchinson |
| | | *Courses open to all. No knowledge of Greek required* | | | | | |
| 59 | 1 | Greek Architecture ..... | | | Jr., sr. | | None |
| | | | 3 | W | 114F | | Hutchinson |
| 60 | 1 | Sculpture ..... | | | Jr., sr. | | None |
| | | | 3 | W | 114F | | Hutchinson |
| 61 | 2 | Drama ..... | | | Jr., sr. | | None |
| | | | 2 | TTh | 114F | | Savage |
| 62 | 2 | Literature and Life ..... | | | Jr., sr. | | None |
| | | | 2 | TTh | 114F | | Savage |
| 63-64 | 1 or 2 | Mythology ..... | | | Jr., sr. | | None |
| | | | 3 | Th | 114F | | Savage |

1-2. FIRST YEAR GREEK. General principles, inflections, word-formation, syntax, elementary readings, composition. HUTCHINSON, SAVAGE.

3-4. HISTORY AND EPIC POETRY. Selections from Xenophon's *Anabasis,* and from Homer's *Iliad.* SAVAGE, HUTCHINSON.

7. DRAMATIC POETRY. Euripides' *Alcestis*. Introductory course in the drama. SAVAGE.

*51. PHILOSOPHY. Plato's *Apology*, and selections from other dialogues of Plato. HUTCHINSON.

*52. ORATORY. Selections from Lysias, Demosthenes, and Isocrates; lectures on Greek oratory. SAVAGE.

*53-54. COMPOSITION. An advanced course in syntax and style, chiefly for those who expect to teach Greek. HUTCHINSON.

*101. LYRIC POETRY. Selections from the elegiac, iambic, lyric, and bucolic poets. HUTCHINSON.

*102. TRAGEDY. Aeschylus or Sophocles. Special attention given to the development of the drama, and to the literary form and dramatic representation of the plays read. SAVAGE.

*103. THE SEPTUAGINT. Especially intended for those who are preparing for the ministry. HUTCHINSON.

*104. THE NEW TESTAMENT. Especially intended for those who are preparing for the ministry, or for some other form of religious work. HUTCHINSON.

59-60. GREEK ARCHAEOLOGY. A study of the Greek spirit as manifested in architecture and sculpture. First semester, architecture; second semester, sculpture. HUTCHINSON.

61. GREEK DRAMA. The reading and interpretation of representative Greek plays; lectures dealing with the origin, growth, character and influence of the Greek drama; special stereopticon lectures. Students taking this course may not receive credit for Course 62. SAVAGE.

62. GREEK LITERATURE AND LIFE. Lectures, textbook, illustrative and assigned readings; special lectures illustrated by stereopticon views. Recommended to those who intend to teach Greek, Latin, English, or ancient history. SAVAGE.

63-64. GREEK MYTHOLOGY. Lectures, textbook, and assigned readings, supplemented by occasional stereopticon illustrations. Recommended to those specializing in languages or philosophy. SAVAGE.

## HISTORY

Professors GUY STANTON FORD, CARL LOTUS BECKER, WILLIAM STEARNS DAVIS, ALBERT BEEBE WHITE; Associate Professor WALLACE NOTESTEIN; Assistant Professors SOLON JUSTUS BUCK, AUGUST CHARLES KREY; Instructor WAYNE E. STEVENS; Teaching Fellows CHARLES BYRON KUHLMANN, RUTH ELIZABETH MARSHALL.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor*, twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* see general statement (page 24).

*For a Teacher's Certificate,* eighteen credits in History, including at least three credits in intensive courses. In addition the student must take History 54.

The Departments of History, Economics, Political Science, Sociology and Anthropology constitute a social science group. The subjects are closely interrelated, and are of especial importance to students who intend to engage in law, business, public service at home or abroad, journalism, and the work of charities and corrections, or to give instruction in one of the social sciences. Students who are interested in any one of the departments of the social science group ought to be familiar with at least the elements of the subjects offered in the other departments. A student who takes his major in any one of them ought to have more than the elements of the others.

COURSES

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 1-2 | 6 | Med. and Modern Europe.. | All | None |
| | | 1 (Lecture) W | 30Ph | Ford, Krey |
| | | 8 TS | 111L | |
| | | 9 MW | 3F | |
| | | 9 TS | 111L | |
| | | 10 MW | 3F | |
| | | 11 MF | 5F | |
| | | 11 TS | 111L | |
| | | 3 MF | 111L | |
| 2a-1b | 6 | Med. and Modern Europe.. | All | None |
| | | 10 TThS | 301F | |
| 3-4 | 6 | English to 1783 ..... | All | None |
| | | 1 (Lecture) M | 301F | White |
| | | 1 (Lecture) M | 308F | Notestein |
| | | 9 WF | 112L | |
| | | 9 TTh | 112L | |
| | | 10 WF | 112L | |
| | | 10 TTh | 112L | |
| | | 11 WF | 112L | |
| | | 11 TTh | 112L | |
| | | 2 WF | 112L | |
| | | 3 WF | 112L | |
| 5-6 | 6 | American History ..... | Soph., jr., sr. | 6 credits |
| | | 10 (Lecture) M | 110F | Becker, Buck |
| | | 10 WF | 111L | |
| | | 10 ThS | 15F | |
| | | 11 WF | 3F | |
| 7 | 3 | English History, 1750-1916. | Soph., jr., sr. | 6 credits |
| | | 2 MWF | 25F | Notestein |
| 9 | 3 | National Movements ..... | Soph., jr., sr. | 6 credits |
| | | 11 MWF | 111L | Ford |
| 10 | 3 | Europe in 19th Century.... | Soph., jr., sr. | 6 credits |
| | | See statement | | |
| 13 | 3 | Medieval Civilization ..... | Soph., jr., sr. | 6 credits |
| | | See statement | | |
| 14 | 3 | Renaissance and Reform'n. | Soph., jr., sr. | 6 credits |
| | | 11 MWF | 25F | Krey |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *21 | 3 | Topics in Greek History... See statement | Jr., sr. | 9 credits |
| *23 | 3 | Topics in Roman History... See statement | Jr., sr. | 9 credits |
| *56-57 | 3 | Teachers' Course ..... 4 MW | Jr., sr. 111L | See statement Krey |
| *101 | 3 | French Revolution ..... 2-3:30 TTh | Jr., sr., grad. 111L | 9 credits Becker |
| *104 | 3 | The Near East..... 10 TThS | Jr., sr., grad. 111L | 9 credits Davis |
| *121-122 | 6 | History of Greece..... See statement | Jr., sr., grad. | See statement |
| *123-124 | 6 | History of Rome..... 3 MWF | Jr., sr., grad. 25F | See statement Davis |
| *125 | 3 | History of Old Orient..... 10 TThS | Jr., sr., grad. 111L | 9 credits Davis |
| *133-134 | 6 | Ancient Civilization ..... 11 TThS | Jr., sr., grad. 3F | See statement Davis |
| *136 | 3 | Outlines of Prussian Hist.. 11 MWF | Jr., sr., grad. 111Lib | 9 credits Ford |
| *137 | 3 | English Constitutional Hist. 4-5:30 TTh | Jr., sr., grad. 218Lib | 9 credits (inc. 3-4) White |
| *141 | 3 | West in American History. 3 MWF | Jr., sr., grad. 218Lib | 9 credits (inc. 5-6) Buck |
| *144 | 3 | History of Minnesota..... 3 MWF | Jr., sr., grad. 219Lib | 9 credits (inc. 5-6) Buck |
| *154 | 3 | American Revolution ..... 2-3:30 TTh | Sr., grad. 218Lib | 12 credits (inc. 5-6) Becker |
| *162 | 3 | Beginnings of Parliament... 4-5:30 TTh | Jr., sr., grad. 218Lib | See statement White |
| *163 | 3 | English Judicial System.... See statement | Jr., sr., grad. | See statement |
| *171-172 | 6 | German History ..... See statement | Sr., grad. | See statement |
| *181 | 3 | English Backgrounds of American History ..... 4-5:30 WF | Sr., grad. 218Lib | 12 credits (inc. 3-4) Notestein |
| *182 | 3 | English Colonization in America ..... 4-5:30 WF | Sr., grad. 218Lib | 12 credits (inc. 5-6 or 181) Notestein |
| *184 | 3 | Stuart Period ..... See statement | Sr., grad. | See statement |
| *191 | 3 | Age of the Crusades..... 1:30-3 TTh | Sr., grad. 218Lib | See statement Krey |

1-2. MEDIEVAL AND MODERN HISTORY. The development of Europe from 800 A.D. to the French Revolution. Designed as a background for later work in the history, literature, and politics of continental Europe. FORD, KREY, STEVENS, KUHLMANN.

1b. MEDIEVAL HISTORY TO THE REFORMATION. Repetition of first semester of History 1-2.

3-4. ENGLISH HISTORY TO 1783. General political history of England from the earliest times to close of the American Revolution, with special reference to development of governmental institutions. Serves as

introduction to further work in English history, literature, and politics. WHITE, NOTESTEIN, STEVENS, MARSHALL.

GENERAL COURSES

5-6. AMERICAN HISTORY. A general survey of American history to the present time. Chief emphasis upon the National period. If possible, Political Science I should accompany or follow this course. BECKER, BUCK, STEVENS.

7. ENGLISH HISTORY 1750-1915. Textbooks, assigned readings and lectures. Emphasis placed upon the industrial revolution, franchise reforms, relations with the United States and very recent history. NOTESTEIN.

9. NATIONAL MOVEMENTS. A study of European history in the age of Bismarck, with special reference to the national movements between 1848 and 1870 and to Germany since 1870. FORD.

10. EUROPE IN THE NINETEENTH CENTURY. The national movements of the nineteenth century and those European conditions which form the basis of modern world politics. Not offered in 1916-17. FORD.

13. MEDIEVAL CIVILIZATION. A study of the social and intellectual development of Europe from the period of the German migration to the end of the thirteenth century. Not offered in 1916-17. KREY.

14. THE RENAISSANCE AND REFORMATION. The Renaissance and Reformation as general European movements with especial emphasis upon the work of individual men and upon ideas rather than upon politics and institutions; how the medieval world became the modern world. KREY.

*21. SELECTED TOPICS IN GREEK HISTORY. Open to juniors and seniors eligible for Course 121-122, but desiring a shorter course. Alternates with Course 121-122. Not offered in 1916-17. DAVIS.

*23. ROMAN HISTORY (Short Course). Open to students eligible for Course 123-124, but desiring a shorter course. To alternate with Course 123-124. Not offered in 1916-17. DAVIS.

*56-57. THE TEACHING OF HISTORY AND GOVERNMENT. Open only to students who have eighteen credits in History, including a starred course. Deals chiefly with the practical problems of teaching history and government in the secondary schools. Students planning to teach government must have 9 credits in Political Science. KREY et al.

*101. THE FRENCH REVOLUTION. A study of the conditions in France at the opening of the Revolution, and of the revolutionary movement from 1789 to 1799. BECKER.

*104. THE NEAR EAST. Turkey, the Balkan States, and European diplomacy in the East since 1453, with special reference to causes of the war of 1914. DAVIS.

*121-122. History of Greece. Political and social development of the Greek states up to their incorporation into the Roman Empire. Permanent influence of Greek civilization. Prerequisites nine credits in History, or six credits in History and a major in Greek. Not open to those having taken History 21. Alternates with Course 22. Not offered in 1916-17. Davis.

*123-124. History of Rome. Social and political development with considerable attention to cultural subjects. Prerequisites, nine credits in History, or six credits and a major in Latin. Alternates with Course 24. Davis.

*125. History of the Old Orient. Origin of Egyptians, Babylonians, Assyrians, and Persians, and main features of their political history and civilization. History of the Hebrews discussed so far as it bears upon general Oriental problems. Alternates with Course 104. Davis.

*133-134. Ancient Civilization. First semester, Greece, second semester, Rome. Social and intellectual life of antiquity, with special reference to those factors which have persisted to the present day. A working knowledge of the political history assumed. Prerequisites, twelve credits in History, or a major in Greek or Latin and six credits in History. Davis.

*136. Outlines of Prussian History to the Death of Frederick the Great. Ford.

*137. English Constitutional History. Origin and early development of the English government, with emphasis upon judicial institutions. White.

*141. The West in American History to 1815. The westward movement of population and civilization; its political, economic, and social aspects; and the results upon national development. Buck.

*144. History of Minnesota since 1815. The settlement and development—political, economic, and social—of a typical American commonwealth. Buck.

## ADVANCED OR INTENSIVE COURSES

*154. The American Revolution. A study of the conditions in the American colonies and in England that led to the Revolutionary War, and of the political, military, and diplomatic events of the war itself. Becker.

*162. The Beginnings of Parliament. Parliamentary beginnings from the Norman Conquest to reign of Edward I, based wholly on original sources. Prerequisites, twelve credits in history, including Course 3-4, and permission of the instructor; knowledge of at least high-school Latin. White.

*163. Origin of the English Judicial System. The origin and early

development of the most distinctive features in England's present day courts and procedure. Prerequisites, same as Course 161. Not offered in 1916-17. WHITE.

*171-172. GERMAN HISTORY. A general survey with special reference to the rise of Brandenburg-Prussia since 1640. Prerequisites, the permission of the instructor; twelve credits in History, or History 1-2 and a major in German. Not given in 1916-17. FORD.

*181. ENGLISH BACKGROUNDS OF AMERICAN HISTORY. A survey of the political and social institutions of England in the reign of Charles I, with special emphasis upon the local institutions. NOTESTEIN.

*182. ENGLISH COLONIZATION IN AMERICA. Alternates with Course 184. A study of institutions in New England and Virginia. NOTESTEIN.

*184. STUART PERIOD. English 111-112 is strongly recommended as a desirable reinforcing subject. Alternates with Course 182. Not offered in 1916-17. NOTESTEIN.

*191. SOCIAL AND ECONOMIC EUROPE IN THE AGE OF THE CRUSADES. A study of Europe and the Latin East during the twelfth and thirteenth centuries. Prerequisites: twelve credits in History; a reading knowledge of two of the following languages: French, German, Latin. KREY.

## HOME ECONOMICS

### THE COLLEGE OF AGRICULTURE

Professor JOSEPHINE T. BERRY; Assistant Professors HARRIET GOLDSTEIN, MABEL B. TRILLING, MARION WELLER, GRACE I. WILLIAMS; Instructors ANNA E. BAYHA, BESSIE E. BEMIS, VETTA GOLDSTEIN, AMY P. MORSE, ETHEL L. PHELPS, ALICE L. THOMAS, ELIZABETH VERMILYE; Lecturer MARTHA B. MOORHEAD.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor*, six credits in the Food Study group (Courses 21 and 22), together with Physiology 3 and Bacteriology 58.

### COURSES

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 1a or 1b | 2 | Textiles ..... | | All | None |
| | | 8:00-9:40 | MW | 307, 211He | Trilling |
| | | 8:00-9:40 | TTh | 307, 211He | Phelps |
| | | 2:00-3:40 | MF | 307, 211He | Trilling |
| 11a or 11b | 3 | Garment Making ..... | | All | None |
| | | 8:00-9:40 | MWF | 304He | Phelps |
| | | 8:00-9:40 | TThS | 305He | Bayha |
| | | 2:00-4:30 | MF | 304He | Phelps |
| | | 2:00-4:30 | TTh | 304He | Phelps |

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 13a or 13b | 3 | Dressmaking ..... | | Soph., jr., sr. | 1, 11 |
| | | 9:50-11:30 | MWF | 304He | Trilling |
| | | 9:50-11:30 | TThS | 304He | Bayha |
| | | 2:00- 4:30 | MF | 305He | Bayha |
| 21a | 3 | Foods and Cookery ..... | | Soph., jr., sr. | Chem. 3, or equiv.; 1 entrance unit Domestic Sci.; Physiology 3 parallel |
| | | 2:00-4:30 | MF | 209, 309He | Bemis |
| 22a | 3 | Food Economics ..... | | Soph., jr., sr. | 21 or 23 |
| | | 2:00-4:30 | MF | 207, 205He | Williams |
| 22b | 3 | Food Economics ..... | | Soph., jr., sr. | 21 or 23 |
| | | 2:00- 4:30 | TTh | 209, 205He | Bemis |
| | | 9:50-11:30 | MWF | 209, 205He | Thomas |
| | | 9:50-11:30 | TThS | 207, 205He | Bemis |
| 23a or 23b | 5 | Foods and Cookery ..... | | Soph., jr., sr. | Chem. 3, or equiv.; Physiol. 3 parallel |
| | | 2:00-4:30 | MF | 107, 106He | Vermilye |
| | | 2:00-3:40 | W | 107, 106He | Vermilye |
| 33 | 1 | Home Care of the Sick... | | Jr. | Chem. 3, 7, or 21; Bacteriol. 58 |
| | | 8:00-8:55 | T | 203He | Moorhead |
| | | 8:00-8:55 | Th or S | *NW WH | Fisher |
| 51a or 51b | 3 | Drawing and Design..... | | All | None |
| | | 8:00-9:40 | MWF | 311He | H. Goldstein |
| | | 8:00-9:40 | TThS | 311He | H. Goldstein |
| | | 2:00-3:40 | MWF | 311He | V. Goldstein |
| 53a or 53b | 3 | Advanced Design ..... | | Soph., jr., sr. | 51 |
| | | 9:50-11:30 | MWF | 313He | Morse |
| | | 2:00- 3:40 | MWF | 313He | H. Goldstein |
| | | 2:00- 4:30 | TTh | 313He | H. Goldstein |

* NW WH, New Wing, Women's Hall.

1a,b. TEXTILES. A study of the textile fibers and fabrics as to structure and properties, with application to the art and economic considerations involved in selection and purchase of fabrics for clothing and household furnishing. WELLER, TRILLING, PHELPS.

11a,b. GARMENT MAKING. Instruction and laboratory practice in hand sewing; in the reading and adaptation of commercial patterns; in the construction and use of the sewing machine; in designing, cutting, and making simple outer garments from washable materials. PHELPS, BAYHA.

13a,b. DRESSMAKING. Careful consideration of factors of quality, suitability, cost in selection of dress fabrics employed; analysis and adaptation of simple dress designs; instruction and practice in cutting, fitting, draping, methods of construction involved in tailored dresses. TRILLING, BAYHA.

21a,b. FOODS AND COOKERY. (a) Production, manufacture, chemical composition of typical foods; their classification into food principles; changes in digestion; function in nutrition. (b) Fundamental science principles from chemistry, physics, biology, bacteriology, and their application in typical cookery processes. WILLIAMS, BEMIS, THOMAS.

22a,b. FOOD ECONOMICS. Cost and nutritive value of typical foods; the study of dietaries; preparation and serving of meals, the cost bearing a definite relation to the family budget. WILLIAMS, BEMIS, VERMILYE, THOMAS.

23a or 23b. FOODS AND COOKERY. This course follows the same outline as 21a or 21b, with a more detailed treatment of each topic. WILLIAMS, BEMIS, VERMILYE.

33. HOME CARE OF THE SICK. (a) First aid; communicable diseases, their transmission and prevention; hygiene of infancy, maidenhood, maturity. (b) The care of the sick room; observation and care of the patient; elementary symptomatology. MOORHEAD, .....

51a,b. DRAWING AND DESIGN. Composition, perspective, color theory, and color harmonies applied to costume design and interiors; harmony, balance, rhythm, in line and area design. GOLDSTEIN.

53a,b. HISTORIC ORNAMENT AND ADVANCED DESIGN. Historic styles in art and architecture; pure design and applied design. GOLDSTEIN, MORSE.

## HUMAN ANATOMY

### THE MEDICAL SCHOOL

Professors CLARENCE M. JACKSON, JOHN B. JOHNSTON, THOMAS G. LEE, RICHARD E. SCAMMON; Associate Professor CHARLES A. ERDMANN; Instructor JAY A. MYERS.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

Prerequisites in Animal Biology may be counted as a part of the work for a minor or a major.

### COURSES

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 3-4 | 10 | Gross Human Anatomy .... | Soph., jr., sr. | An. Biol. 1-2 |
| | Lab. 8, 9, 10, 11 | TThS | 304-308IA | Jackson, et al. |
| | Lect. 1 | MW | 304IA | Jackson |
| *101 | 5 | Human Histology ..... | Jr., sr., grad. | An. Biol. 7-8 |
| | Lab. 8, 9, 10 | MWF | 105-108IA | Scammon, et al. |
| | Lect. 11 | WF | 102IA | Scammon |
| *102 | 3 | Human Embryology ..... | Jr., sr., grad. | An. Biol. 7-8 |
| | Lect. 11 | MW | 102IA | Scammon |
| | Quiz. 3 | Th | 106-108IA | Lee, et al. |
| | Lab. 3, 4, 5 | M or W or F | 106-108IA | Lee, et al. |
| *103 | 3 | Human Neurology ..... | Sr., grad. | Anat. 101 and 102, or An. Biol. 7-8 or 19-20 |
| | Lab. 8, 9, 10 | ThS | 214-215IA | Johnston |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *114 | 3 | Topographic Anatomy ..... | Sr., grad. | 3-4 |
| | Lab. 1, 2, 3 | TTh | 313IA | Jackson |
| *115 | 3 | Fetal Anatomy ..... | Sr., grad. | 3-4 and 102 or An. Biol. 137 |
| | Lab. Ar. | TTh | 214IA | Scammon |

NOTE: Since the number of students in anatomy courses Nos. 3-4, 101 and 102 is limited, students will not be permitted to register for these courses without written permission by the head of the department.

3-4. GROSS HUMAN ANATOMY. Dissection, including osteology. Laboratory work, with lectures and quizzes. JACKSON, ERDMANN, and Assistants.

*101. HUMAN HISTOLOGY. Microscopic study of the various tissues and organs. Laboratory work, with lectures and quizzes. SCAMMON.

*102. HUMAN EMBRYOLOGY. The development of the human body. Laboratory work, with lectures and quizzes. LEE, SCAMMON.

*103. HUMAN NEUROLOGY. A study of the central nervous system and sense organs. Lectures, recitations, and laboratory work. JOHNSTON, MYERS.

112. ANATOMICAL TECHNIQUE. Microtechnique, reconstruction and museum methods, etc. Laboratory work and occasional lectures. Limited to sixteen students. LEE.

*115. TOPOGRAPHIC ANATOMY. A study of the position and relations of the various organs, based upon serial cross-sections of the human body. Laboratory work, with lectures and quizzes. JACKSON.

*116. FETAL ANATOMY. Dissection of the human fetus, with comparison of earlier embryonic and later postnatal structure. Laboratory work, largely individual in character, with conferences and written reports. SCAMMON.

## HUMAN PHYSIOLOGY

### THE MEDICAL SCHOOL

Professor ELIAS P. LYON; Associate Professors RICHARD OLDING BEARD, FREDERICK H. SCOTT; Assistant Professors JOHN F. MCCLENDON, M. RUSSELL WILCOX; Instructors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE; Assistants EDWARD D. ANDERSON, ALBERT M. SNELL, FRED S. RICHARDSON.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, which may include Animal Biology 1-2.

*For a Major,* Animal Biology 1-2 and eighteen credits, including Physiology 102, 103, and 104. In these eighteen credits may be included Anatomy 101 and Animal Biology 15-16.

## COURSES

| No. | Credit | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 3a or 3b | 3† | Elem. Human Physiology... | | Soph., jr., sr. | 1 yr. Chem., half yr. Biol. |
| | | 1:30-3:30 | T | 214MH | Beard, or Lyon, et al. |
| | | 1:30-5:00 | Th | | |
| 4 | 4† | Elementary Physiology .... | | Soph., jr., sr. | Elem. Chem. & Biol. or Anat. |
| | | 8-10 | T | 214, 301MH | Beard, et al. |
| | | 8-12 | Th | | |
| | | 8-9 | S | | |
| 5 | 3† | Elementary Physiology .... | | Jr., sr. | Elem. Chem. & Biol. or Anat. |
| | | 9-11 | T | 214, 301MH | Lyon, et al. |
| | | 9-12 | Th | | |
| 6 | 3† | Elem. Physiol. Chemistry .. | | Soph., jr., sr. | Elem. Chem. & Biol. or Anat. |
| | | 10-12 | T | 214, 310MH | Pettibone, et al. |
| | | 9-12 | S | | |
| 7 | 2† | Elem. Physiol. Chemistry .. | | Jr., sr. | Elem. Chem. & Biol. or Anat. |
| | | 11-12 | T | | |
| | | 9-12 | S | 214, 310MH | Pettibone, et al. |
| *102 | 5 | Physiologic Chem. ..... | | Jr., sr., grad. | Organic Chem. |
| | | 8-11 | MW | 214, 310MH | Pettibone, et al. |
| | | 8-12 | F | | |
| *103 | 4 | Physiol. Muscle, etc. ..... | | Jr., sr., grad. | An. Biol. 1-2 |
| | | 1-3 | M | 214, 301MH | Scott, et al. |
| | | 1-4:30 | W | | |
| | | 1-3:30 | F | | |
| *104 | 4 | Physiol. Nerv. Sys., etc. ... | | Jr., sr., grad. | An. Biol. 1-2 |
| | | 1-3 | M | 214, 301MH | Lyon, et al. |
| | | 1-4:30 | W | | |
| | | 1-3:30 | F | | |
| *111 | 3 | Physical Chem. of Cells.... | | Jr., sr., grad. | Organ. Chem. & An. Biol. 1-2 |
| | | 2-5 | TTh | 303MH | McClendon |
| *112 | 3 | Electro-Physiology..... | | Jr., sr., grad. | Organ. Chem. & An. Biol. 1-2 |
| | | 2-5 | TTh | 303MH | McClendon |
| *113-114 | 3‡ | Advanced Physiology ..... | | Jr., sr., grad. | Physiol. 103 |
| | | 1-4 | TTh or Ar | 301MH | Lyon, Scott, or McClendon |
| *115-116 | 1½ or 3 | Conference ..... | | Jr., sr., grad. | Physiol. 102, 103, 104 |
| | | 10-11:30 | Th | 315MH | Lyon or Scott |
| *137a,b | 2 | Foods and Prac. Dietetics.. | | Jr., sr. | Physiol. 3 or equiv. |
| | | 2:30-5:00 | Th | 315MH&UH | Beard |
| *138 | 2 | Physiol. of Development.... | | Jr., sr. | Physiol. 3 or equiv. |
| | | 2:30-3:30 | TTh | 315MH&UH | Beard |
| *151-152 | 6 | Physiologic Chemistry ..... | | Jr., sr., grad. | Organic Chem. |
| | | 1-4 | TTh | 315, 310MH | Kingsbury, et al. |
| *161 | 1½ | Urinalysis ..... | | Jr., sr., grad. | Physiol. Chem. |
| | | 1-4 | TTh | 310MH | Pettibone, 1st qtr. |

† Students may now receive credit for any two of Courses 3, 4, and 5; or for both Courses 6 and 7.

‡ Or more.

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *163 | 1½ | Metabolism ..... | Jr., sr., grad. | Physiol. Chem. |
| | | 1-4 TTh | 310MH | Pettibone, 2d qtr. |
| *164 | 3 | Quantitative Methods ..... | Jr., sr., grad. | Physiol. Chem. |
| | | Ar Ar | 310MH | Kingsbury |

For a full list of courses offered by the department, see the bulletin of the Medical School.

## INTRODUCTORY COURSES

3a,b. ELEMENTARY HUMAN PHYSIOLOGY. School for Nurses, Home Economics students and others. BEARD, LYON, SCOTT, and Assistants.

4. ELEMENTARY PHYSIOLOGY. Sophomore dental students and others. LYON, BEARD, SCOTT, and Assistants.

†5. ELEMENTARY PHYSIOLOGY. Junior dental students and others. LYON, BEARD, SCOTT, and Assistants.

6. ELEMENTARY PHYSIOLOGIC CHEMISTRY. Sophomore dental students and others. PETTIBONE, KINGSBURY, and Assistants.

†7. ELEMENTARY PHYSIOLOGIC CHEMISTRY. Junior dental students and others. PETTIBONE, KINGSBURY, and Assistants.

## ADVANCED COURSES

*102. PHYSIOLOGIC CHEMISTRY. The components of the animal body; foods, digestion, the excreta and metabolism. PETTIBONE, KINGSBURY, MCCLENDON, and Assistants.

*103. PHYSIOLOGY OF MUSCLE, NERVE, BLOOD, CIRCULATION AND DIGESTION. SCOTT, LYON, BEARD, MCCLENDON, and Assistants.

*104. PHYSIOLOGY OF THE NERVOUS SYSTEM AND SPECIAL SENSES; RESPIRATION, METABOLISM, NUTRITION, AND EXCRETION. LYON, BEARD, SCOTT, MCCLENDON, and Assistants.

*111. PHYSICAL CHEMISTRY OF CELLS. Osmotic pressure, surface tension, and electric conductivity of blood and urine; colloids; permeability of cells and tissues and changes in permeability produced by electrolytes. MCCLENDON.

*112. ELECTRO-PHYSIOLOGY. The bio-electric currents and the theory of stimulation and narcosis. Hydrogen ion concentration and its relation to enzyme activity and irritability. MCCLENDON.

*113-114. ADVANCED PHYSIOLOGY. Course arranged by instructors with qualified students. Each student will be assigned a topic for special laboratory study, leading in some cases to original investigation. LYON, SCOTT, MCCLENDON.

*115-116. CONFERENCE COURSE IN PHYSIOLOGY; STUDENT SEMINAR. Informal lectures and library study. Topic: First quarter, internal se-

† Given only 1916-17.

cretion; second quarter, digestion; third quarter, respiration; fourth quarter, nervous system. LYON, SCOTT.

*137a,b. FOODS AND PRACTICAL DIETETICS. A study of human foods and food values; of the principles of food selection; of caloric indices and balanced dietaries. Exercises in the practical preparation of foods. Second quarter; repeated fourth quarter. Limited to twelve students. BEARD, THOMAS.

*138. PHYSIOLOGY OF DEVELOPMENT. The physiology of the ovum, the embryo, the fetus; the functions of menstruation, ovulation, pregnancy, parturition and lactation; the functional characteristics of birth, infancy, childhood, adolescence, maturity, and old age. BEARD.

*151-152. PHYSIOLOGIC CHEMISTRY. The components of the body, foods, digestion and metabolism. KINGSBURY and Assistants.

*153-154. ADVANCED PHYSIOLOGIC CHEMISTRY. Course arranged by instructors with qualified students for special work. PETTIBONE, KINGSBURY.

*161. URINALYSIS. Advanced methods. First quarter. PETTIBONE.

*163. METABOLISM. Special phases of metabolism. Lectures may be taken alone; number of students unlimited. Laboratory course limited to ten students. PETTIBONE.

*164. QUANTITATIVE METHODS. The estimation of certain important substances in the urine, blood, and other body fluids. KINGSBURY.

## LATIN

Professors JOSEPH B. PIKE, JOHN E. GRANRUD.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* Courses 5, 6, 57 and 58 for those entering with four years of Latin; Courses 1, 2, 5 and 6 for those entering with two or three years of Latin.

*For a Major,* eighteen credits for those entering with four years of Latin; twenty-four credits for all others.

*For a Teacher's Minor Recommendation,* Courses 5, 6, 57, 58, and 101; *for a Major Recommendation,* these same courses with the addition of Course 102, with an average of at least one and one-half honor points per credit hour.

*For B.A. with Honors,* the general requirements (page 24) and a fair reading knowledge of German or French or Greek. Six credits in Latin a semester during the junior and senior years are to be selected from Courses 57 to 204. (Students who do not desire a recommendation for teaching Latin may, by selecting courses that are given in alternate years, secure enough work for the honors course without being obliged to take Course 101 or 102.) Instead of taking all the work indicated

above in Latin, the student may substitute six credits in Greek (third-year Greek or above), or six credits in Greek or Roman History, or six credits in ancient Philosophy.

COURSES

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 1 | 3 | Select. from Latin Authors. | All | 2 or 3 yrs. Latin |
| | | 9 TThS | 107F ¶ | |
| 2 | 3 | Select. from Latin Authors. | All | 2 or 3 yrs. Latin |
| | | 9 TThS | 107F ¶ | |
| 5 | 3 | Livy ..... | All | 1 & 2 or 4 yrs. Latin |
| | | 10 TThS | 109F ¶ | |
| 6 | 3 | Plautus and Terence ..... | All | 1 & 2 or 4 yrs. Latin |
| | | 10 TThS | 109F ¶ | |
| *57 | 3 | Horace ..... | Soph., jr., sr. | 6 |
| | | 9 MWF | 109F | Pike |
| *58 | 3 | Pliny ..... | Soph., jr., sr. | 57 |
| | | 9 MWF | 109F | Pike |
| *101 | 3 | Advanced Caesar ..... | Jr., sr. | 58 |
| | | 9 TThS | 109F | Pike |
| *102 | 3 | Advanced Vergil ..... | Jr., sr. | 101 |
| | | 9 TThS | 109F | Pike |
| *104 | 2 | Latin Writing ..... | Jr., sr., grad. | 58 |
| | | See statement | | Pike |
| *105 | 3 | Roman Elegy ..... | Jr., sr., grad. | 58 |
| | | See statement | | Granrud |
| *106 | 3 | The Roman Novel ..... | Jr., sr., grad. | 58 |
| | | 10 MWF | 109F | Pike |
| *107 | 3 | Letters of Cicero ..... | Jr., sr., grad. | 58 |
| | | 11 MWF | 107F | Granrud |
| *108 | 3 | Tacitus ..... | Jr., sr., grad. | 58 |
| | | See statement | | Granrud |
| *110 | 3 | Roman Satire ..... | Jr., sr., grad. | 58 |
| | | 11 MWF | 107F | Granrud |
| 9 | 1 | Roman Architecture ..... | Jr., sr. | None |
| | | 11 S | 107F | Granrud |
| 10 | 1 | Roman Art ..... | Jr., sr. | None |
| | | 11 S | 107F | Granrud |
| *201-202 | 6 | Lucretius ..... | Grad. and honor. | Consult department |
| | | See statement | | Pike |
| *203-204 | 6 | Seneca ..... | Grad. and honor. | Consult department |
| | | 3 and 5 T | 109F | Pike |
| *205-206 | 6 | Cicero ..... | Grad. and honor. | Consult department |
| | | 3 and 5 Th | 107F | Granrud |

1. SELECTIONS FROM LATIN AUTHORS. An effort will be made to give a general view of Roman life and literature. (Students entering at mid-year with two or three years' preparation in Latin may take Course 2). GRANRUD.

2. SELECTIONS FROM LATIN AUTHORS. A continuation of Course 1. GRANRUD.

5. LIVY. Selections. Review of principles of Latin Syntax. PIKE, GRANRUD.

6. PLAUTUS AND TERENCE. Translation of selected plays with study of

beginnings of Roman drama. (Students entering at mid-year with four years of Latin may enter Course 6.) PIKE, GRANRUD.

*57. HORACE. Selections from the odes, epodes, satires, and epistles, with a study of the life and literary art of Horace. PIKE.

*58. PLINY. Selected letters of Pliny the Younger. PIKE.

*101. ADVANCED COURSE IN CAESAR. (Teachers' Course). Selections from books five to seven of the Gallic War; the principles of indirect discourse; intermediate Latin composition; class drill and discussion of various problems connected with secondary school work in Latin. PIKE.

*102. ADVANCED COURSE IN VERGIL. An interpretation of selections from books seven to twelve of the Aeneid; review of portions of books one to six; the quantitative method of pronouncing Latin verse; metrical rendering of selected passages. PIKE.

*104. LATIN WRITING. Study of Latin prose style. Alternates with Course 106. Not offered in 1916-17. PIKE.

*105. ROMAN ELEGY. Selections from Catullus, Tibullus, Propertius, and Ovid. The origin, development, and technique of Roman Elegy. Not offered in 1916-17. GRANRUD.

*106. THE ROMAN NOVEL. The *Cupid and Psyche* of Apuleius and *Trimalchio's Dinner* of Petronius. A study of the ancient novel. PIKE.

*107. LETTERS OF CICERO. Selections from his correspondence. A study of his life and times, his literary art and methods. Alternates with Course 105. GRANRUD.

*108. TACITUS. Selections from his works. A study of the development of Roman historical literature, and of the sources, methods, and literary characteristics of Tacitus. Not offered in 1916-17. GRANRUD.

*110. ROMAN SATIRE. Selections from Juvenal. The beginnings, evolution, and distinctive qualities of Roman Satire; Juvenal as a literary artist and a moralist. Alternates with Course 108. GRANRUD.

9. ROMAN ARCHITECTURE AND LIFE. National characteristics, the Forum and its activities, the forums and palaces of the Caesars, Roman houses and furniture, theaters, amphitheaters, circuses, thermae, and triumphal arches. Illustrated lectures, quizzes. Not credited toward a major or minor. GRANRUD.

10. ROMAN AND ITALIAN ART. Roman portrait sculpture and historical reliefs. Pompeian wall decoration and painting. Italian scenery and typical cathedrals, select masterpieces of Raphael and Michael Angelo. Illustrated lectures and quizzes. Not credited toward a major or minor. GRANRUD.

*201-202. LUCRETIUS. (Graduate seminar but open to students who register for honors in Latin). Interpretation of the text of Lucretius with

a study of his philosophy and its sources. Not offered in 1916-17. PIKE.

*203-204. SENECA. (Graduate seminar but open to students who register for honors in Latin.) Selections from the letters and essays of Seneca the philosopher. A study of Roman Stoicism. Alternates with Courses 201-202. PIKE.

*205-206. CICERO. (Graduate seminar but open to students who register for honors in Latin.) Selections from the rhetorical works of Cicero. Cicero's theory of an artistic style. GRANRUD.

## MATHEMATICS

Professors GEORGE N. BAUER, FRANCIS P. LEAVENWORTH; Associate Professor WILLIAM H. BUSSEY; Assistant Professors ROYAL R. SHUMWAY, HERMON L. SLOBIN, ANTHONY L. UNDERHILL, WILLIAM D. REEVE; Instructors RALPH M. BARTON, CLARENCE MCCORMICK; Assistants KARL HOLZINGER, VERA WRIGHT.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve or sixteen credits according as the freshman course taken is three or five hours a week.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 24). In junior and senior years any courses above 50 may be presented, except Course 54. Astronomy 101-102, Physics 121-122, and, with the consent of the major department, other courses open only to juniors and seniors may be presented.

*For a Teacher's Certificate,* an average of at least one and one-half honor points per credit hour through Course 51; Course 54; and an average of at least one honor point per credit hour in all other courses taken in the department. Course 6 must be included if not offered for admission.

### COURSES

| No. | Credit | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1a | 5 | Higher Alg., Part I..... | | Fr., soph. | | Elem. Algebra |
| | | 8 | TWThFS | 125F | ¶ | |
| | | 9 | TWThFS | 125F | ¶ | |
| | | 11 | TWThFS | 104F | ¶ | |
| | | 2 | MTWThF | 104F | ¶ | |
| 1b | 5 | Higher Alg., Part I..... | | Fr., soph. | | Elem. Algebra |
| | | 8 | TWThFS | 105F | ¶ | |
| 2a | 5 | Alg. & Pl. Trig..... | | Fr., soph. | | 1 or prep. higher Alg. |
| | | 9 | TWThFS | 104F | ¶ | |
| | | 10 | TWThFS | 105F | ¶ | |
| 2b | 5 | Alg. & Pl. Trig..... | | Fr., soph. | | 1 or prep. higher Alg. |
| | | 8 | TWThFS | 125F | ¶ | |
| | | 9 | TWThFS | 125F | ¶ | |
| | | 11 | TWThFS | 104F | ¶ | |
| | | 2 | MTWThF | 104F | ¶ | |

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 3a | | Higher Alg., Part II..... | | Fr., soph. | Prep. higher Alg. |
| | | 8 | TThS | 104F | ¶ |
| | | 10 | MWF | 104F | ¶ |
| | | 10 | TThS | 104F | ¶ |
| | | 2 | VF | 101F | ¶ |
| | | 3 | VF | 102F | ¶ |
| 3b | 3 | Higher Alg., Part II..... | | Fr., soph. | Prep. higher Alg. |
| | | 8 | MWF | 104F | ¶ |
| 4a | 3 | Trigonometry ..... | | Fr., soph. | 3 |
| | | 8 | MWF | 104F | ¶ |
| 4b | 3 | Trigonometry ..... | | Fr., soph. | 3 |
| | | 8 | TThS | 104F | ¶ |
| | | 10 | MWF | 104F | ¶ |
| | | 10 | TThS | 104F | ¶ |
| | | 2 | MWF | 101F | ¶ |
| | | 3 | MWF | 102F | ¶ |
| 6 | 2 | Solid Geometry ..... | | Soph., jr., sr., who have not had Solid Geometry | 1-2 or 3-4 or 2-9 |
| | | 11 | WF | 101F | Bussey |
| 7 | 3 | Pl. Analyt. Geom. ..... | | Soph., jr., sr. | 2 or 4 |
| | | 9 | TThS | 102F | Bussey |
| | | 2 | MWF | 102F | Barton |
| 9a | 5 | Pl. & Sol. Anal. Geom..... | | Soph., jr., sr. | 2 or 4 |
| | | 9 | TWThFS | 101F | Shumway |
| 9b | 5 | Pl. & Sol. Anal. Geom..... | | Fr., soph., jr., sr. | 2 or 4 |
| | | 9 | TWThFS | 104F | ¶ |
| | | 10 | TWThFS | 105F | ¶ |
| 11a | 3 | Differential Calculus ..... | | Soph., jr., sr. | 7 or 9 |
| | | 11 | TThS | 102F | Underhill, Slobin |
| 11b | 3 | Differential Calculus ..... | | Soph., jr., sr. | 7 or 9 |
| | | 9 | TThS | 102F | Bussey |
| | | 2 | MWF | 102F | Barton |
| 51a | 3 | Integral Calculus ..... | | Soph., jr., sr. | 11 |
| | | 11 | TThS | 101F | Bauer |
| 51b | 3 | Integral Calculus ..... | | Soph., jr., sr. | 11 |
| | | 11 | TThS | 102F | Underhill |
| *54a | 2 | Teachers' Course ..... | | Jr., sr. | 11 |
| | | 3 | TTh | 115Ed | Reeve |
| *54b | 2 | Teachers' Course ..... | | Jr., sr. | 11 |
| | | 3 | TTh | 115Ed | Reeve |
| *62 | 3 | Theory of Equations..... | | Jr., sr. | 11 |
| | | 2 | MWF | 125F | Shumway |
| *71 | 3 | Solid Anal. Geom..... | | Jr., sr. | 11 |
| | | 9 | MWF | 102F | Bussey |
| *102 | 3 | Adv. Pl. Anal. Geom..... (Not offered in 1916-17) | | Jr., sr., grad. | 11 |
| *104 | 3 | Modern Synthetic Geom..... | | Jr., sr., grad. | 11 |
| | | 9 | MWF | 102F | Bussey |
| *107 | 3 | Adv. Differential Calc..... | | Jr., sr., grad. | 51 |
| | | 11 | MWF | 102F | Underhill |
| *108 | 3 | Adv. Integral Calc..... | | Jr., sr., grad. | 51, 101 |
| | | 11 | TThS | 101F | Bauer |

Any of the following courses for which a sufficient number of students apply will be given in 1916-17:

| | | | | |
|---|---|---|---|---|
| *106a or *106b | 3 | Differential Equations.. | Sr., grad. | 51 |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *119a or *119b | 3 | Modern Higher Alg.... | Sr., grad. | 51 |
| *125-*126 | 6 | Differential Geometry.. | Sr., grad. | 51 |
| *127a or *127b | 3 | Infinite Series ..... | Sr., grad. | 17 credits besides Alg. and Trig. |
| *140 | 2 | Meth. of Least Squares. | Sr., grad. | 51 |

1a,b. HIGHER ALGEBRA, PART I. Rapid review, factoring, fractions and fractional equations, simultaneous linear equations with graphs, involution, evolution, theory of exponents, radicals, radical equations, quadratic equations, simultaneous quadratics with graphs. SHUMWAY, SLOBIN, UNDERHILL, BARTON, MCCORMICK, HOLZINGER, WRIGHT.

2a,b. ALGEBRA CONTINUED THROUGH LOGARITHMS AND PLANE TRIGONOMETRY. Progressions, mathematical induction, determinants, theory of equations, Trigonometry. Those who intend to specialize in Mathematics should take this course rather than Course 3. BAUER, SLOBIN, UNDERHILL, BARTON, HOLZINGER, WRIGHT.

3a,b. HIGHER ALGEBRA, PART II. Rapid review of quadratics, equations in quadratic form, graphical solution of quadratics, simultaneous quadratics with graphs, mathematical induction, binomial theorem, permutations and combinations, determinants, theory of equations. BUSSEY, SHUMWAY, SLOBIN, UNDERHILL, BARTON, MCCORMICK.

4a,b. LOGARITHMS AND TRIGONOMETRY. Text, tables, and numerous problems. BUSSEY, SHUMWAY, SLOBIN, UNDERHILL, MCCORMICK.

6. SOLID AND SPHERICAL GEOMETRY. This course is intended primarily for those who are preparing for high school teaching and who did not present Solid Geometry for entrance. Text and lectures. BUSSEY.

7. PLANE AND ANALYTICAL GEOMETRY. Rectilinear and polar coördinates, loci and their equations, transformation of coördinates, the straight line, conic sections, higher plane curves. BAUER, BUSSEY, SHUMWAY, SLOBIN, BARTON.

9a,b. PLANE AND SOLID ANALYTICAL GEOMETRY. A more extended course in Plane Analytical Geometry than Course 7, and an introduction to Solid Analytical Geometry. For those who intend to specialize in Mathematics. Not open to those who have taken Course 7. BUSSEY, SHUMWAY, SLOBIN, UNDERHILL.

11a,b. DIFFERENTIAL CALCULUS. Differentiation of algebraic and transcendental functions, development of functions, indeterminate forms, maxima and minima, treatment of tangents, subtangents, normals, subnormals, asymptotes, direction and rate of curvature, evolutes, envelopes, and singular points. BAUER, BUSSEY, SHUMWAY, SLOBIN, UNDERHILL, BARTON.

51a,b. INTEGRAL CALCULUS. Integration of the various forms, integration as summation, rectification of curves, quadrature of plane and curved surfaces, cubature of volumes, equations of loci, successive in-

tegration with applications to moment of inertia, areas and volumes. BAUER, UNDERHILL.

54a,b. TEACHERS' COURSE. Text and assigned readings. Special attention paid to the fundamental principles of Algebra and Geometry. REEVE.

*62. THEORY OF EQUATIONS. Algebraic solution of cubic and quartic equations, properties of roots of an equation, symmetric functions, isolation of real roots, solution of numerical equations, complex numbers, fundamental theorem of Algebra, determinants, discriminants, resultants. Text and lectures. SHUMWAY.

*71. SOLID ANALYTICAL GEOMETRY. Elementary theorems of projection, coördinates, the plane, the line in space, quadric surfaces, transformation of coördinates, tangents, poles and polars, the general equation of the second degree. Numerous examples assigned to illustrate the theory. BUSSEY.

*102. ADVANCED COURSE IN PLANE ANALYTICAL GEOMETRY. Supplements Course 7 and 9, treating more fully of the subjects of those courses, and taking up additional topics. Not offered in 1916-17. BUSSEY.

*104. MODERN SYNTHETIC GEOMETRY. Based upon the method of central projection without the use of coördinates. BUSSEY.

*107. ADVANCED DIFFERENTIAL CALCULUS. Infinitesimals of different orders, partial and total derivatives, introduction to infinite series, Taylor's and Maclaurin's expansions with applications of the Calculus to plane curves. UNDERHILL.

*108. ADVANCED INTEGRAL CALCULUS. Deals with the definite integral as the limit of a sum, improper integrals, the Beta and Gamma functions, elliptic integrals, differentiation and integration under the sign of integration; numerous applications to geometry and mechanics. BAUER.

Any of the following courses for which a sufficient number of students apply will be given in 1916-17.

*106a,b. DIFFERENTIAL EQUATIONS. Text and lectures. SLOBIN.

*119a,b. MODERN HIGHER ALGEBRA. SHUMWAY.

*125-126. DIFFERENTIAL GEOMETRY. UNDERHILL.

*127a,b. INFINITE SERIES. BAUER.

*140. METHOD OF LEAST SQUARES. The combination and adjustment of observations and the discussion of their precision as applied especially to Engineering, Physics, and Astronomy. LEAVENWORTH.

## MILITARY SCIENCE AND TACTICS

Professor and Commandant BERNARD LENTZ; Assistant Commandant and Brigade Adjutant WALTER F. RHINOW; Band Instructor BERT ROSE.

COURSES

| No. | Credit | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1-2 | None | Military Drill ..... | | Fr. | | None |
| | | 2-5 | Th | A | Lieut. Lentz | |
| 3-4 | None | Military Drill ..... | | Soph. | | 1 year's drill |
| | | 2-5 | Th | A | Lieut. Lentz | |
| 5-6 | 3† | Military Drill ..... | | Jr., sr. | | 2 years' drill |
| | | 2-5 | Th | A | Lieut. Lentz | |
| 8 | 2‡ | Military Science ..... | | Jr., sr. | | 2 years' drill |
| | | Ar. | | A | Lieut. Lentz | |

† No student may receive more than a total of six credits for elective work in both Physical Education and Military Drill.

‡ If taken in connection wtih Course 5-6.

1-6. MILITARY DRILL. Required of all men in the freshman and sophomore classes. Students are cautioned to report for the first drill and inform themselves of the requirements of the department.

1-2. Freshman: Practical instruction in schools of the soldier, company, and battalion; signals, ceremonies; first aid.

3-4. Sophmore: Practical and theoretical instruction in schools of the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

5-6. May be taken voluntarily by others outside of the freshman and sophomore classes. No credit will be allowed for such drill for less than one year.

8. MILITARY SCIENCE. Instruction in advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

## MUSIC

Professor CARLYLE SCOTT; Assistant Professor DONALD FERGUSON; Special Instructors MAXIMILIAN DICK, THADDEUS GIDDINGS, GERTRUDE REEVES, CLARA WILLIAMS.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, not including Courses 11-12 and 21-22.

*A Major* is offered only to those who take the four-year course in Arts and Music.

For the curriculum of the four-year course in Arts and Music, leading to the degree of Bachelor of Arts in Music, see page 25. The tabular statement and description of courses given below are for the guidance of other students in the College of Science, Literature, and the Arts who desire to elect Music.

COURSES

| No. | Credit | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1-2 | 6 | Harmony ..... | | Jr., sr. | | None |
| | | 10 | TThS | Mu | Scott | |
| | | 11 | TThS | Mu | Scott | |

| No. | Credits | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 3-4 | 4 | Counterpoint ..... | | Jr., sr. | | Harmony |
| | | 11 | TTh | Mu | Ferguson | |
| 5-6 | 4 | Composition ..... | | Jr., sr. | | |
| | | Ar | Ar | Mu | Ferguson | |
| 7-8 | 2 | Analysis ..... | | Jr., sr. | | Harmony |
| | | 12 | W | Mu | Scott | |
| 9-10 | 6 | History of Music ..... | | Soph., jr., sr. | | None |
| | | 9 | MWF | Mu | Ferguson | |
| 11-12 | 1 | Appreciation of Music.... | | Jr., sr. | | None |
| | | 2 | M | Mu | Reeves | |
| 13-14 | ½ | Bach-Beethoven ..... | | Jr., sr. | | None |
| | | 1, 2 | T | Mu | Ferguson | |
| 15-16 | 4 or 8 | Pianoforte ..... | | Jr., sr. | | |
| 17-18 | | Ar | | Mu | Scott<br>Ferguson<br>Reeves | |
| 19-20 | 4 or 8 | Violin ..... | | Jr., sr. | | |
| | | Ar | | Mu | Dick | |
| 21-22 | 4 | Voice ..... | | Jr., sr. | | |
| | | Ar | | Mu | Williams | |
| 27-28 | 6 | Public School Music..... | | Jr., sr. | | |
| | | 4, 5 | WF | Ed | Giddings | |
| 29-30 | 4 | Normal Piano ..... | | Jr., sr. | | |
| | | 3 | TF | Mu | Reeves | |
| 31-32 | 2 | Ensemble ..... | | Jr., sr. | | |
| | | 12 | F | Mu | Dick | |
| 33-34 | | Ear Training ..... | | Jr., sr. | | None |
| | | 2 | Th | Mu | Reeves | |
| 35-36 | 2 | Orchestra ..... | | Soph., jr., sr. | | |
| | | 7:30 | M | ME | Ferguson | |

1-2. HARMONY. The study of chords, their construction, relations, and progressions. Written exercises on basses, the harmonization of given melodies. SCOTT.

3-4. COUNTERPOINT. First semester: strict counterpoint up to eight parts. Second semester: free contrapuntal harmonization of chorales and composition of smaller contrapuntal forms such as inventions. FERGUSON.

5-6. MUSICAL FORM AND FREE COMPOSITION. For those specializing in Music and can be taken only with the consent of the instructor. At the close of the year a program of original compositions will be given. FERGUSON.

7-8. ANALYSIS. The analysis of musical works as regards their formal construction: subdivision of themes into phrases, sections, and motives. Symphonies to be presented by the local orchestra are among the compositions used in this course. SCOTT.

9-10. HISTORY OF MUSIC. Some account of primitive systems and of the early Christian modal and harmonic developments, leading to a general survey of musical literature from Bach to the present time. FERGUSON.

11-12. APPRECIATION OF MUSIC. A non-technical course. No prerequisite. REEVES.

13-14. First semester: Bach and Beethoven. Second semester: Wagner and Brahms. Critical study of selection from master works of the four greatest composers. Biographical readings, topics and analyses, giving historical and literary background to culminative periods in composition. FERGUSON.

15-16, 17-18. PIANOFORTE. Open to juniors who have mastered technical difficulties of the degree of Czerny's *School of Velocity* and the easier Haydn and Mozart sonatas. The fee is thirty-two or sixty-four dollars a semester. SCOTT, FERGUSON, REEVES.

19-20. VIOLIN. Candidate must be able to play the first ten of Kreutzer's forty etudes, and the easier Handel and Mozart sonatas. DICK.

21-22. VOICE CULTURE. Thoro training in relaxation and breath control, the foundations of tone production. Great advantages are also offered to the advanced singer, in the study of the best in vocal literature, songs, oratorio, and opera. Fee, forty dollars per semester. WILLIAMS.

23-24. VIOLONCELLO. Instructor provided if the work is called for.

25-26. OTHER ORCHESTRAL INSTRUMENTS.

27-28. PUBLIC SCHOOL MUSIC. Preparation for teachers and supervisors of music in public, high, and normal schools. Piano-playing, singing, and ready reading prerequisite. Four hours in class and one half day weekly in public school visiting. Practice teaching demanded. GIDDINGS.

29-30. NORMAL PIANO. Special course offered to students desiring to teach pianoforte as a profession. REEVES.

31-32. ENSEMBLE. Students sufficiently advanced will be given opportunity for ensemble practice, viz., piano, four and eight hands; string and piano and vocal trios, quartets, etc. DICK.

33-34. EAR TRAINING. A non-technical course. Required of all music students. No prerequisite. REEVES.

35-36. ORCHESTRA. Practical study of orchestral literature: standard symphonies, overtures, concertos, etc., with public performance as frequently as practicable. May be taken a second year with credit. FERGUSON.

## PHILOSOPHY AND PSYCHOLOGY

Professors NORMAN WILDE, MELVIN E. HAGGERTY; Associate Professor DAVID F. SWENSON; Assistant Professors HERBERT WOODROW, JOSEPH PETERSON, RUPERT C. LODGE; Instructors HAROLD R. CROSLAND, JOHN F. DASHIELL, JACOB KANTOR.

## REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits, either in Philosophy or in Psychology. The following courses are classified under Philosophy: 9, 13, 20, 51, 56, 63, 64, 109, 118, 121, 122, 123, 124, 126, 127, 129-130, 135. A major in Philosophy must include Courses 9, 121, and 122, as well as a minimum of three, or a maximum of six, credits in the psychological group. The following courses are classified under Psychology: 1-2, 5, 17, 18, 55, 56, 101, 105, 107, 108, 109, 115-116; a major in Psychology must include Courses 1-2 and 101, as well as a minimum of three, or a maximum of six, credits from the philosophical group.

*For B.A. with Honors,* besides the general requirements (page 24), a major in either Philosophy or Psychology, and twenty-four credits in starred courses.

### COURSES

| No. | Credit | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1-2 | 6 | General Psychology ..... | | Soph., jr., sr. | | None |
| | | 8 | MWF | 321F | Peterson | |
| | | 8 | TThS | 321F | Kantor | |
| | | 9 | MWF | 321F | Peterson | |
| | | 10 | MWF | 321F | Haggerty | |
| | | 10 | TThS | 321F | Dashiell | |
| | | 11 | MWF | 321F | Crosland | |
| | | 11 | TThS | 321F | Dashiell | |
| | | 2 | MWF | 321F | Peterson | |
| | | 2 | MWF | 321F | Dashiell | |
| | | 3 | MWF | 321F | Kantor | |
| 5a | 3 | Elements of Psychology..... | | Soph., jr., sr. | | None |
| | | 9 | MWF | 322F | Swenson | |
| | | 2 | MWF | 322F | Lodge | |
| 5b | 3 | Elements of Psychology..... | | Soph., jr., sr. | | None |
| | | 10 | TThS | | Lodge | |
| | | 3 | MWF | 322F | Lodge | |
| 5b | 3 | Elem. of Psych. (mu. course) | | Soph., jr., sr. | | None |
| | | 9 | T ThS | 318F | Woodrow | |
| 9a | 3 | Logic ..... | | Soph., jr., sr. | | None |
| | | 10 | TThS | | Lodge | |
| | | 3 | MWF | 322F | Lodge | |
| 9b | 3 | Logic ..... | | Soph., jr., sr. | | None |
| | | 9 | MWF | 322F | Swenson | |
| | | 2 | MWF | 322F | Lodge | |
| *13 | 3 | Intro. to Philosophy..... | | Soph., jr., sr. | | 3 credits |
| | | See statement | | | | |
| *17 | 3 | Methods of Study..... | | Soph., jr., sr. | | 5 or 1-2 |
| | | See statement | | | | |
| 18 | 3 | Child Development ..... | | Soph., jr., sr. | | 5 or 1-2 |
| | | 8 | MWF | 322F | Dashiell | |
| *20 | 3 | Present Day Philosophy..... | | Jr., sr. | | 6 credits |
| | | 10 | MWF | 322F | Wilde | |
| *51a | 3 | Ethics ..... | | Jr., sr. | | 6 credits |
| | | 10 | MWF | 322F | Wilde | |
| | | 10 | TThS | 322F | Wilde | |

| No. | Credits | Title | | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|---|
| *55 | 3 | Abnormal Psychology ..... | | | Jr., sr. | | 6 credits incl. 5 or 1-2 |
| | | 8 | TThS | | 322F | Crosland | |
| *56 | 3 | Esthetics ..... | | | Jr., sr. | | 6 credits |
| | | 8 | TThS | | 322F | Swenson | |
| *65 | 3 | Devel. of Religion..... | | | Jr., sr. | | 6 credits |
| | | 9 | TThS | | 322F | Swenson | |
| *66 | 3 | Philosophy of Religion..... | | | Jr., sr. | | 6 credits |
| | | 9 | TThS | | 322F | Swenson | |
| *101a | 3 | Exper. Psychology ..... | | | Jr., sr., grad. | | 1-2 |
| | | 2, 3 | MW | | 318F | Woodrow and | |
| | | 2, 3 | TTh | | 318F | Crosland | |
| *101a | 3 | Exper. Psychology Lect..... | | | Jr., sr., grad. | | 1-2 |
| | | 4 | T | | 322 | Woodrow | |
| *101b | 3 | Exper. Psychology ..... | | | Jr., sr., grad. | | 1-2 |
| | | 2, 3 | MW | | 318F | Woodrow and | |
| | | 2, 3 | TTh | | 318F | Crosland | |
| *101b | 3 | Exper. Psychology Lect..... | | | Jr., sr., grad. | | 1-2 |
| | | 4 | T | | 322 | Woodrow | |
| *105 | 3 | Mental Retardation ..... | | | Jr., sr., grad. | | 1-2 |
| | | 4, 5 | Th | | 316F | Woodrow | |
| *107 | 3 | Social Psychology ..... | | | Jr., sr., grad. | | 6 credits incl. 5 or 1-2 |
| | | 9 | TThS | | 311½F | Peterson | |
| *108 | 3 | Comparative Psychology .... | | | Jr., sr., grad. | | 101 |
| | | 9 | TThS | | 311½F | Peterson | |
| *109 | 3 | Psychological Principles .... | | | Jr., sr., grad. | | 12 credits including 9 and 1-2 or 5 |
| | | 8 | MWF | | 322F | Kantor | |
| *115-116 | 6 | Seminar in Psychology..... | | | Sr., grad. | | 12 credits |
| | | Ar. | Ar. | | 316F | Woodrow | |
| *118 | 3 | Advanced Ethics ..... | | | Jr., sr., grad. | | 6 credits |
| | | 10 | TThS | | 322F | Wilde | |
| *121 | 3 | Ancient Philosophy ..... | | | Jr., sr., grad. | | 6 credits |
| | | 11 | TThS | | 322F | Wilde | |
| *122 | 3 | Modern Philosophy ..... | | | Jr., sr., grad. | | 6 credits |
| | | 11 | TThS | | 322F | Wilde | |
| *123 | 3 | Scandinavian Philosophy ... | | | Sr., grad. | | 9 credits |
| | | Ar. | Ar. | | 316F | Swenson | |
| *124 | 3 | 19th Century Philosophy.... | | | Sr., grad. | | 12 credits in Phil. |
| | | 11 | MWF | | 322F | Lodge | |
| *126 | 3 | Logic of Science..... | | | Jr., sr., grad. | | 9 credits including 9 |
| | | See statement | | | | | |
| *127 | 3 | Metaphysics ..... | | | Sr., grad. | | 12 credits |
| | | See statement | | | | | |
| *129-130 | 6 | Seminar in Philosophy..... | | | Sr., grad. | | 12 credits |
| | | Ar. | Ar. | | 316F | Wilde | |
| *135 | 3 | Philosophy of Plato..... | | | Sr., grad. | | 121, 122, or 124 |
| | | 11 | MWF | | 322F | Lodge | |

1-2. General Psychology. The aims and methods of psychology; the facts, laws and functions of mental life; development and learning in relation to training and instinct. Required for a teacher's certificate. Haggerty, Peterson, Dashiell, Kantor, Crosland.

5a or 5b. Elements of Psychology. A brief outline for those who do not intend to take further work in psychology. Together with Course 9 a satisfactory introduction to the philosophical courses of the junior year. Swenson, Lodge.

9a or 9b. LOGIC. The nature of knowledge, the laws of reasoning, the principles and methods of scientific proof. Together with Course 5 a satisfactory introduction to the philosophical courses of the junior year. SWENSON, LODGE.

13. INTRODUCTION TO PHILOSOPHY. The aim, method, and chief problems of philosophy. Not given in 1916-17.

17. METHODS OF STUDY. Some results of modern psychology in their application to the problems of the learner; ways of avoiding and overcoming obstacles in study. Not given in 1916-17.

18. CHILD DEVELOPMENT. A study of the stages of development from infancy through adolescence for those interested in parenthood and education. DASHIELL.

20. PRESENT DAY PHILOSOPHY. An untechnical discussion of the most important types of contemporary philosophy. Among the men and movements included are: Royce, James, Eucken, Bergson, Haeckel, Neo-Realism, Nietzsche. WILDE.

*51a or 51b. ETHICS. The principles of morals; sketch of the historical development of morality followed by an analysis of its meaning, and of its basis in human nature. WILDE.

*55. ABNORMAL PSYCHOLOGY. Unusual and pathological phenomena; the sub-conscious, dreams, suggestibility, hypnotism, mental disorders, secondary personalities. CROSLAND.

*56. ESTHETICS. An introduction to the history and theory of esthetics, psychological analysis of beauty, and a discussion of the arts. SWENSON.

*63. DEVELOPMENT OF RELIGION. The development of religious ideas and practices; a summary of the typical historical religions; the chief methods of modern psychological investigation. SWENSON.

*64. PHILOSOPHY OF RELIGION. Religion as an interpretation and evaluation of life; speculative idealism, the mysticism of Emerson, the estheticism of Nietzsche, the ethics of Carlyle; Christianity as a transcendent ethical religion. SWENSON.

*101a or 101b. EXPERIMENTAL PSYCHOLOGY. Laboratory experiments designed to demonstrate the fundamental facts and laws of mental life. WOODROW, CROSLAND.

*105. MENTAL RETARDATION. The nature and causes of retarded and perverted development in children; tests for the detection of mental defects; remedial measures. WOODROW.

*107. SOCIAL PSYCHOLOGY. The instinctive and acquired factors in the behavior of the individual toward society in its various forms and groupings, and in the growth of ideas of self and of social attitudes. PETERSON.

*108. COMPARATIVE PSYCHOLOGY. The development of the problems and methods of animal psychology; current experimental methods and results; relations of animal and human behavior. PETERSON.

*109. PSYCHOLOGICAL PRINCIPLES. Detailed study of the more general problems in psychology. KANTOR.

*115-116. SEMINAR IN PSYCHOLOGY. Major or minor research in experimental, analytical, genetic, or comparative psychology. WOODROW.

*118. ADVANCED ETHICS. A study of the main types of ethical theory. WILDE.

*121. ANCIENT AND MEDIEVAL PHILOSOPHY. Such an outline of the history of thought as is desirable in a general education. Emphasis placed upon the human significance of philosophy rather than upon its purely technical aspect. WILDE.

*122. MODERN PHILOSOPHY. Continues Course 121. Lectures on the representative systems of modern philosophy from the Renaissance to the beginning of the nineteenth century; to prepare the student to understand the philosophical tendencies of the present. WILDE.

*123. SCANDINAVIAN PHILOSOPHY. Philosophic thought of the 19th century, including a comparative study of Boström and Kierkegaard. Reading knowledge of Scandinavian required. SWENSON.

*124. NINETEENTH CENTURY PHILOSOPHY. Continues Course 122. Modern currents of thought from the idealism of Fichte and Hegel, to the philosophy of evolution, pragmatism, and the new realism. LODGE.

*126. LOGIC OF SCIENCE. An introduction to philosophy through the medium of the special sciences, its aim being to suggest a system of the sciences through a discussion of the nature and relation of their fundamental principles. Not given in 1916-17.

*127. METAPHYSICS. A critical and constructive study of the theories of knowledge and reality. Not given in 1916-17.

*129-130. SEMINAR IN PHILOSOPHY. Individual investigation in the field of philosophy. The character of the work and the general topic for the year can be ascertained by consultation with the department. WILDE.

*135. THE PHILOSOPHY OF PLATO. LODGE.

## PHYSICAL EDUCATION

### FOR MEN

Director LOUIS J. COOKE; Assistant Director WILLIAM K. FOSTER; Instructor JOHN C. WEST; Assistant BOTTOLF M. OHNSTAD.

The purpose of the department is to provide all men of the University opportunity for exercise in order to maintain and build up their

general health. It also provides special training for the correction of physical defects and functional derangements.

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. Students taking the required work in physical education are examined also at the close of the year. A study of these records shows a marked improvement in the standard of health of the average student during his college course.

The gymnasium, swimming pool, and baths are open to all students of the University, who are free to use the apparatus and to pursue a course in physical training under the supervision of the director and his assistants.

Those students, taking the required course in physical education, who can not swim, must make a reasonable effort, as determined by the department, to pass the swimming and life-saving requirements, and will be assigned special hours for instruction.

COURSES

| No. | Credit | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1 | None | Personal Hygiene ..... | | Fr. | | None |
| | | 2 | MF | 201A | Cooke | |
| | | 3 | MF | 201A | Cooke | |
| | | 11 | TS | 201A | Cooke | |
| | | 11 | WF | 201A | Cooke | |
| 3-4 | None | Gymnasium ..... | | Fr. | | None |
| | | 2 | MF | 100A | Foster-West | |
| | | 3 | MF | 100A | Foster-West | |
| | | 11 | TS | 100A | Foster-West | |
| | | 11 | WF | 100A | Foster-West | |
| 5-6 | None | Intermediate Gymnastics.. | | Fr. | | None |
| | | 2 | MF | 100A | Foster-West | |
| | | 3 | MF | 100A | Foster-West | |
| | | 11 | TS | 100A | Foster-West | |
| | | 11 | WF | 100A | Foster-West | |
| †7-8 | 2 | Advanced Leaders ..... | | Soph., jr., sr. | | 1, 3-4, 5-6 |
| | | 2 | MF | 100A | Foster-West | |
| | | 3 | MF | 100A | Foster-West | |
| | | 11 | TS | 100A | Foster-West | |
| | | 11 | WF | 100A | Foster-West | |
| 9-10 | None | Corrective Gymnastics .... | | All | | None |
| | | Ar. | | 100A | Ohnstad | |
| 11-12 | None | Wrestling ..... | | Soph., jr., sr. | | None |
| | | 5 | MWF | 106A | Foster-Ohnstad | |
| 13-14 | None | Advanced Gymnastics .... | | Soph., jr., sr. | | None |
| | | Ar. | | | West-Foster | |
| 15-16 | None | Intermediate Swimming .. | | All | | None |
| | | Ar. | | | Ohnstad | |
| 17-18 | None | Advanced Swimming ..... | | All | | 15-16 |
| | | Ar. | | | Foster-Ohnstad | |

† Both semesters must be completed before credit is given for the first semester.

1. PERSONAL HYGIENE. Two hours per week; first six weeks of first semester. Examination at close of course. COOKE.

*A special lecture* on sex hygiene is given sometime during the first ten days of the autumn semester, with required attendance on the part of all freshmen.

3-4. GYMNASTICS. Two hours a week, from November 1 to end of second semester. Required qualifications in swimming, life-saving, bar-vaulting, jumping, sprinting, running, and on heavy apparatus. FOSTER, WEST.

5-6. INTERMEDIATE GYMNASTICS. Elective for freshmen showing exceptional ability in elementary apparatus work. FOSTER, WEST.

7-8. CLASS LEADERS (ADVANCED). Three hours a week. (No student may receive more than a total of six credits for elective work in both Physical Education and Military Drill.) FOSTER, WEST.

9-10. CORRECTIVE GYMNASTICS. Three hours a week. Special individual courses for students physically defective. OHNSTAD.

11-12. WRESTLING. Course in competitive wrestling. Most promising candidates chosen to represent Minnesota at the Western Intercollegiate Gymnastic and Wrestling Meet. (Optional.) FOSTER, OHNSTAD.

13-14. ADVANCED GYMNASTICS. Same as Course 11 and 12 except that it is in gymnastics instead of wrestling. Includes course in ground tumbling, horizontal bar, parallel bars, side horse, and flying rings. FOSTER, WEST.

15-16, 17-18. SWIMMING, INTERMEDIATE AND ADVANCED. Life saving, efficiency swimming, and fancy diving. Instruction is given in rescuing and restoring the apparently drowned and other useful swimming accomplishments. FOSTER, OHNSTAD.

## PHYSICAL EDUCATION

### FOR WOMEN

Assistant Professor J. ANNA NORRIS; Instructors MAY S. KISSOCK, VALERIA G. LADD, ALICE H. TOLG.

This department aims to promote the health 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 year in college; conducts yearly consultations with, and examines when necessary, all upper class students; gives courses in hygiene; organizes physical work to meet the varying needs and physical tastes of students; coöperates closely with the Woman'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; and investigates cases of illness which come to its attention.

Work in this department is requried of all newly entering students (see Courses 1-2 and 11), and of all students permitted, for reasons connected with their physical condition, to carry less than the minimum number of credit hours. Physical examinations or consultations required annually of all students.

Elective work without credit arranged in social dancing, gymnastic dancing, swimming, fencing, basket ball, baseball, and other activities.

A professional course 15-16 for those who desire to teach will be offered for the first time in 1916-17. All senior students who desire a recommendation for teaching must also take Course 5-6 in 1916-17 whether or not it has been previously taken.

## COURSES

| No. | Credit | Title | | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1-2 | None | Elem. Phys. Train..... | | | Required of all new students | None |
| | | 11 | MWF | 3, 151, 153WGm | | ¶ |
| | | 11 | TThS | 3, 151, 153WGm | | ¶ |
| | | 3 | MWF | 3, 151, 153WGm | | ¶ |
| | | 4 | MWF | 3, 151, 153WGm | | ¶ |
| 3-4 | 3 | Intermed. Phys. Train. ... | | | Soph., jr., sr. | Equivalent of 1-2 |
| | | 3 | TTh | | 153WGm | Kissock |
| | | One other hour to be arranged | | | | |
| 5-6 | 3 | Advanced Phys. Train. .. | | | Jr., sr. | 3-4 |
| | | 4 | TTh | | 153WGm | Ladd |
| | | One other hour to be arranged | | | | |
| 11 | None | Preliminary Hygiene ..... | | | Required of all new students | None |
| | | 12 | M | | 201WGm | ¶ |
| | | 2 | T | | 201WGm | ¶ |
| | | 11 | W | | 201WGm | ¶ |
| | | 8 | S | | 201WGm | ¶ |
| 13 | 3 | Personal Hygiene ..... | | | Soph., jr., sr. | An. Biol. 1-2 |
| | | 9 | TThS | | 201WGm | Norris |
| 14 | 3 | Hygiene of the Family.... | | | Jr., sr. | 13 |
| | | 9 | TThS | | 201WGm | Norris |
| 15-16 | 6 | Principles of Phys. Educ.. | | | Jr., sr. | 1-2, 3-4, 21-22, 31-32 |
| | Lect. | 10 | TThS | 201WGm | | Kissock, Ladd, Tolg. |
| | Lab. | 2 | MWF | 3, 151, 153WGm | | Kissock, Ladd, Tolg. |
| 21-22 | None | Elem. Esthetic Dancing... | | | All | None |
| | | 2 | TTh | | 153WGm | Ladd |
| 23-24 | None | Intermed. Esthetic Dancing | | | All | Equivalent of 21-22 |
| | | 4:30 | M | | 153WGm | Ladd |
| 25-26 | None | Advanced Esthetic Dancing | | | Soph., jr., sr. | 23-24 |
| | | 4:30 | W | | 153WGm | Ladd |
| 31-32 | None | Folk Danc. & Org. Games.. | | | All | None |
| | | 10 | MW | | 151WGm | Kissock |
| | | 3 | TTh | | 151WGm | Ladd |
| 33-34 | None | Hockey, Basket & Base Ball | | | All | Permission of director |
| | | 4:30 | MW | | 151WGm | Kissock |
| | | 4:30 | WF | | 151WGm | Kissock |
| | | 4:30 | MF | | 151WGm | Kissock |

* Six credits the maximum number that can be gained by taking courses in exercise (Courses 3-4, 5-6); only one of these courses may be taken for credit in a semester.

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 41-42 | None | Fencing ..... | | All | None |
| | | 2:00 | F | 153WGm | Kissock |
| 43-44 | None | Elem. Swimming ..... | | Required of Soph. who need instr. in swimming | None |
| | | 3 | M | 51WGm | Hansen |
| | | 4 | M | 51WGm | Hansen |
| | | 3 | T | 51WGm | Hansen |
| | | 4 | T | 51WGm | Hansen |
| | | 3 | Th | 51WGm | Hansen |
| | | 4 | Th | 51WGm | Hansen |
| | | 3 | F | 51WGm | Hansen |
| | | 4 | F | 51WGm | Hansen |
| 45-46 | None | General Swimming ..... | | All | None |

Students who know how to swim are admitted to the natatorium at 12 TTh, at 4:30 MWF, and at 5:00 TTh. All students are admitted to roller skating at one o'clock MWF. Special corrective exercise may be arranged for at 1:00 TTh.

1-2. Elementary Physical Training. Lighter forms of gymnastics; gymnastic dances; indoor and outdoor games; swimming. Study of daily habits of living. Eight-week swimming courses. Freshmen graded *Incomplete* required to repeat as sophomores. Shower bath fee, $1.50 per semester. Kissock, Ladd, Tolg.

3-4. Intermediate Physical Training. Gymnastics, dances, and organized team games. Includes a study of daily habits of living and a written abstract of one book each semester. If taken for no credit, no reading or written work will be required. Shower bath fee, $1.50 per semester. Kissock.

5-6. Advanced Physical Training. Gymnastics and an election of dancing, fencing, or a sport. Written abstract of one book a semester. If taken without credit, no written work or reading will be required. Shower bath fee, $1.50 per semester. Ladd.

11. Preliminary Hygiene. Twelve lectures. The most essential aspects of the care of the body. Norris.

13. Personal Hygiene. The essential knowledge of the care of the body, including a brief consideration of its anatomy and a study of its physiology, the prevention of contagious diseases, and first aid to the injured. Norris.

14. Hygiene of the Family. A study of maternity and infancy and the essentials of home nursing. Norris.

15-16. Principles of Physical Education. A study of the character, purpose, arrangement and progression of developmental and corrective gymnastics, games and dancing; physical examinations and first aid. Includes practice teaching within the class group. Kissock, Ladd, Tolg.

21-22. Elementary Esthetic Dancing. Two hours a week. Ladd.

31-32. Folk Dancing and Organized Games. Graded games for the school and playground. Two hours a week. Kissock.

## PHYSICS

Professors Henry A. Erikson, Anthony Zeleny; Assistant Professor Louis W. McKeehan; Instructors Arthur H. Compton, Ernest O. Dieterich, Paul D. Foote, Paul E. Klopsteg, John T. Tate.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 24); work chosen from any courses above 40, except 90; and any course in mathematics open only to juniors and seniors if approved by the department. Mathematics 106, 107, 108, 140 have already been thus approved. Thesis in connection with any course in Physics above 150.

*For a Teacher's Certificate,* fourteen credits, including Course 90.

Courses 21, 22, 31, 42, 44, 161, 52, 54, with prerequisites in mathematics comprise a three-year course in Physics beginning with the freshman year. It is designed to meet the needs of those who intend to take up the teaching of Physics or who are planning to enter the field of industrial research. It is recommended to those students desiring honors in Physics. Students who have completed courses 1, 2, 3, 4, or Courses 7, 8, 9, 10, may continue with the second year of this course after conference with the department.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 1 | 3 | General Physics ..... | | Soph., jr., sr. | Math. 2 or 4 |
| | | 1 | M | 30Ph | Zeleny |
| | | 8 | TTh | 16Ph | Klopsteg |
| | | 9 | TTh | 17Ph | Dieterich |
| | | 10 | TTh | 16Ph | Klopsteg |
| | | 11 | TTh | 16Ph | Klopsteg |
| | | 11 | WF | 16Ph | Klopsteg |
| 2 | 3 | General Physics ..... | | Soph., jr., sr. | 1 or 7 |
| | | 1 | M | 30Ph | Zeleny |
| | | 8 | TTh | 16Ph | Klopsteg |
| | | 9 | TTh | 17Ph | Dieterich |
| | | 10 | TTh | 16Ph | Klopsteg |
| | | 11 | TTh | 16Ph | Klopsteg |
| | | 11 | WF | 16Ph | Klopsteg |
| 3 | 1 | General Lab. Practice ..... | | Soph., jr., sr. | Registration in 1 |
| | | Ar | Ar | 23Ph | Ar |
| 4 | 1 | General Lab. Practice ..... | | Soph., jr., sr. | See statement |
| | | Ar | Ar | 23Ph | Ar |
| 7 | 4 | General Physics ..... | | Soph., jr., sr. | Math. 2 or 4, see statement |
| | | 1 | F | 30Ph | Erikson |
| | | 8 | MWF | 17Ph | Tate |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 8 | 4 | General Physics ..... | Soph., jr., sr. | 7. See statement |
| | | 1 F | 30Ph | Erikson |
| | | 8 MWF | 17Ph | Tate |
| 9 | 1 | General Lab. Practice..... | Soph., jr., sr. | See statement |
| | | 2-3 F | 23Ph | ..... |
| 10 | 1 | General Lab. Practice..... | Soph., jr., sr. | See statement |
| | | 2-3 F | 23Ph | ..... |
| 21 | 3 | Elements of Mechanics.... | Fr., soph. | High School Physics |
| | | Lect. 10 ThS | 16Ph | Erikson |
| | | Lab. Ar Ar | 31Ph | Erikson |
| 22 | 3 | Elements of Mechanics.... | Fr., soph. | 21, Math. 2 and reg. in Math. 9b |
| | | Lect. 10 ThS | 17Ph | Erikson |
| | | Lab. Ar Ar | 31Ph | Erikson |
| 31 | 3 | Acoustics ..... | Soph., jr., sr. | See statement |
| | | 9 TThS | 16Ph | Erikson |
| 42 | 3 | Heat ..... | Soph., jr., sr. | 2, 8, or 22, Math. 2 or 4 |
| | | 10 TThS | Ar.Ph | Foote |
| 44 | 1 | Experiments in Heat ..... | Soph., jr., sr. | Registration in 42 |
| | | Ar Ar | Ar | Foote |
| 52 | 3 | Light ..... | Soph., jr., sr. | 2, 8, or 22, Math. 2 or 4 |
| | | 9 TThS | 16Ph | Erikson |
| 54 | 1 | Experiments in Light..... | Soph., jr., sr. | Reg. in 52 |
| | | Ar Ar | Ar Ph | Erikson |
| 81 | 2 | Physical Manipulation and Laboratory Technique ... | Soph., jr., sr. | 2 & 4, 8 & 10, or 22 |
| | | 2, 3, 4 TTh | 2Ph | McKeehan |
| 82 | 2 | Physical Instruments of Precision ..... | Soph., jr., sr. | 81 |
| | | 2, 3, 4 TTh | 2Ph | McKeehan |
| *90 | 1 | Teachers' Course ..... | Sr. | 2 & 4, 8 & 10, or 2 years of physics |
| | | Ar Ar | Ar | Klopsteg |
| *121-122 | 6 | Dynamics ..... | Jr., sr., grad. | 2 or 8 or (22) and Math. 51 |
| | | 9 MWF | 17Ph | Tate |
| *125-126 | 6 | Chemical Dynamics ..... | Jr., sr. | 8 & 10 or 22, Math. 51, Chem. 1-2, or 3-4 |
| | | 8 TThS | 17Ph | McKeehan |
| *155 | 3 | Spectrometry ..... | Jr., sr., grad. | 52 and 82 |
| | | 1, 2, 3 MW | 4Ph | Erikson |
| *161 | 4 | Electricity and Magnetism.. | Jr., sr., grad. | 2 & 4, 8 & 10, or 22 |
| | | Ar Ar | Ar Ph | Zeleny |
| *162a | 2 | Electrical Measurements ... | Jr., sr., grad. | 161 |
| | | 3,4 MW | 31Ph | Zeleny |
| | | 10, 11 TTh | 31Ph | Zeleny |
| *162b | 3 | Electrical Measurements .. | Jr., sr., grad. | 161 |
| | | Ar Ar | Ar | Zeleny |
| *166 | 3 | Elec. Meas. of Precision.. | Jr., sr., grad. | 162 |
| | | 3, 4, 5 MF | 31Ph | Zeleny |
| *174 | 3 | Radioactivity and Roentgen Rays ..... | Sr., grad. | 2 and 4 |
| | | Ar Ar | Ar | McKeehan |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *177 | 3 | Radioactivity ..... | Sr., grad. | 8 cr. in Physics and Math. 11 |
| | | 4 MWF | 15Ph | McKeehan |
| *178 | 3 | Radioact. Measurements .. | Sr., grad. | 177 |
| | | 1, 2, 3 MW | 15Ph | McKeehan |
| *181 | 3 | Adv. Phys. Measurements.. | Sr., grad. | 82 |
| | | 2, 3, 4 MW | 2Ph | McKeehan |
| *182 | 3 | Adv. Phys. Measurements. | Sr., grad. | 181 |
| | | 2, 3, 4 MW | 2Ph | McKeehan |
| *191a | 3 | Elem. Phys. Investigation. | Sr., grad. | 82 |
| | | 2, 3, 4 MW | 2Ph | McKeehan |
| *192a | 3 | Elem. Phys. Investigation. | Sr., grad. | 82 |
| | | 2, 3 MWF | 15Ph | Erikson |
| *191b | 3 | Elem. Phys. Investigation. | Sr., grad. | 191 |
| | | 2, 3 MWF | 15Ph | Erikson |
| *192b | 3 | Elem. Phys. Investigation. | Sr., grad. | 191 |
| | | 2, 3, 4 MW | 2Ph | McKeehan |

1. General Physics. Mechanics of solids, fluids, sound, and heat. Treatment experimental rather than mathematical; fundamental principles. First part of general course 1-2. Preferably taken with Course 3, may be taken separately. One lecture, two recitations per week. Zeleny, Dieterich, Klopsteg.

2. General Physics. Light, electricity, magnetism. Treatment experimental; fundamental principles, including those of radioactivity, ionization, X-radiation. Second part of general course 1-2. Preferably taken with Course 4, may be taken separately. One lecture, two recitations per week. Zeleny, Dieterich, Klopsteg.

3. General Laboratory Practice. Physical measurements in the mechanics of solids and fluids, sound, and heat, giving the student a knowledge of experimental methods, and an acquaintance with the fundamental facts of the subject. McKeehan, Dieterich, Tate.

4. General Laboratory Practice. Physical measurements in light, electricity, and magnetism. Open to all who have completed or are taking Course 2, and have attended Courses 3 or 9. McKeehan, Dieterich, Tate.

7. General Physics. Mechanics of solids and fluids, sound, and heat; numerous problems to illustrate the principles. Must be taken in conjunction with Course 9. The first part of a general course 7-8, 9-10. One lecture, three recitations per week. Erikson, Compton, Foote, Tate.

8. General Physics. Light, electricity, and magnetism. Must be taken in conjunction with Course 10. The second part of a general course 7-8, 9-10. One lecture, three recitations per week. Erikson, Compton, Foote, Tate.

9. General Laboratory Practice. Physical measurements in the mechanics of solids and fluids, sound, and heat. Must be taken in conjunction with Course 7. McKeehan, Compton, Foote, Tate.

10. General Laboratory Practice. Physical measurements in light, electricity, and magnetism. Must be taken in conjunction with Course 8. McKeehan, Compton, Foote, Tate.

21. Elements of Mechanics. The mechanics of solids treated from an historical and experimental standpoint. Two recitations and one two-hour session in the laboratory per week. Erikson.

22. Elements of Mechanics. The mechanics of liquids and gases, and wave motion, treated from an experimental standpoint. Two recitations and one two-hour session in the laboratory per week. Erikson.

31. Acoustics. Study of fundamental principles of sound. A course designed primarily for the students in the Department of Music. Open also to academic students who have completed 22 or a general course in Physics. Erikson.

42. Heat. A study of the fundamental principles of heat. One lecture, two recitations per week. Foote.

44. Heat Measurements. A laboratory course in heat supplementary to Course 42. Foote.

52. Light. A study of the fundamental principles of light. One lecture, two recitations per week. Erikson.

54. Light Measurements. A laboratory course in light supplementary to Course 52. Erikson.

81. Physical Manipulation and Laboratory Technique. A practical study of the processes essential in the upkeep of a physical laboratory. Selection, preparation, and purification or cleansing of materials; glass blowing; construction and repair of simple apparatus. McKeehan.

82. Physical Instruments of Precision. A practical study of instruments of precision. The physical principles and mechanical devices employed in their construction. Methods of adjustment and standardization. McKeehan.

*90. Teachers' Course. Methods of presentation; selection of lecture and laboratory experiments; laboratory management. Klopsteg.

*121-122. Dynamics. Some problems essential in advanced physics. Tate.

*125-126. Chemical Dynamics. Designed primarily to meet the needs of students in the School of Chemistry. Open also to academic students. McKeehan.

*155. Spectrometry. Measurements involving the use of prism spectroscopes, plane transmission and reflection gratings, concave grating, and the interferometers. Erikson.

*161. Electricity and Magnetism. The phenomena accompanying the passage of electricity through solids, liquids, and gases. One lec-

ture, one recitation, and one two-hour laboratory period a week. ZELENY.

*162a,b. ELECTRICAL MEASUREMENTS. Devoted mainly to the study of capacity, inductance, and magnetic flux. ZELENY.

*166. ELECTRICAL MEASUREMENTS OF PRECISION. Making of standard cells, calibration of Wheatstone box bridge; adjustment of resistances, ammeters, and voltmeters; use of the potentiometer; problems involving capacity, inductance, and magnetic flux. ZELENY.

*177. RADIOACTIVITY. Lectures, experimental and descriptive; the various theories and methods of investigation. Detailed study of the radioactive elements. MCKEEHAN.

*178. RADIOACTIVITY MEASUREMENTS. Laboratory technique in radioactivity. MCKEEHAN.

*181. ADVANCED PHYSICAL MEASUREMENTS. Individual work in the laboratory on topics specially chosen to serve best the needs and capacity of each student; intended to introduce him to some of the more intricate physical measurements. ERIKSON, ZELENY, MCKEEHAN.

*182. ADVANCED PHYSICAL MEASUREMENTS. Continuation of Course 181.

*191a,b. ELEMENTARY PHYSICAL INVESTIGATION. The experimental or theoretical study of physical phenomena, the nature or laws of which are not yet understood. ERIKSON, ZELENY, MCKEEHAN.

*192a,b. ELEMENTARY PHYSICAL INVESTIGATION. Continuation of Course 191.

## POLITICAL SCIENCE

Professors WILLIAM A. SCHAPER, CEPHAS D. ALLIN, *JEREMIAH S. YOUNG; Instructors WILLIAM ANDERSON, BEN A. ARNESON; Assistant PERCIVAL W. VIESSELMAN.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* see general requirements (page 24).

*For a Teacher's Certificate in Government,* nine credits in Political Science and eighteen credits in History.

The Departments of Economics, Political Science, History, and Sociology and Anthropology constitute a social science group. The subjects are intimately interrelated, and they are all of especial importance to students who intend to engage in law, business, public service at home or abroad, journalism, the work of charities and corrections, or to give instruction in one of the social sciences. Students who are interested in

* Absent on leave 1916-17.

the work of any one of the departments of the social science group ought to be familiar with at least the elements of the subjects offered in the other departments. A student who takes his major in any one of them ought to have more than the elements of the others.

COURSES

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| | | *Introductory Courses* | | |
| 1a | 3 | American Government ..... | Soph., jr., sr. | None |
| | | 9 MWF | 109MA | Allin |
| | | 9 TThS | 102MA | Schaper |
| | | 10 MWF | 209MA | Anderson |
| | | 10 TThS | Ar | Viesselman |
| | | 11 TThS | 202MA | Allin |
| | | 11 MWF | 109MA | Arneson |
| | | 2 MWF | 109MA | Anderson |
| 1b | 3 | American Government ..... | Soph., jr., sr. | None |
| | | 9 TThS | 109MA | Anderson |
| | | 10 MWF | 202MA | Allin |
| | | 11 TThS | Ar | Arneson |
| | | 2 MWF | 209MA | Anderson |
| | | *General Courses* | | |
| 3 | 3 | Comparative Government ... | Soph., jr., sr. | 1 |
| | | 10 TThS | 102MA | Allin |
| 5 | 3 | European Municipal Admin.. | Soph., jr., sr. | 1 |
| | | 11 MWF | 102MA | Schaper |
| 6 | 3 | American Municipal Admin.. | Soph., jr., sr. | 1 |
| | | 11 MWF | 109MA | Schaper |
| 7a | 3 | State and Local Government.. | Soph., jr., sr. | 1 |
| | | 9 TThS | 109MA | Anderson |
| | | 11 TThS | Ar | Arneson |
| | | 2 MWF | 209MA | Viesselman |
| 7b | 3 | State and Local Government. | Soph., jr., sr. | 1 |
| | | 9 TThS | Ar | Arneson |
| | | 10 MWF | 109MA | Anderson |
| | | 11 TThS | 202MA | Viesselman |
| | | 2 MWF | 202MA | Arneson |
| 9 | 3 | Colonial Administration ..... | Soph., jr., sr. | 1 |
| | | See statement | | |
| *51 | 3 | Business Law, I ..... | Jr., sr. | 6 cred. in Pol. Sci., or 6 in Econ., or 3 in each |
| | | 9 MWF | 202MA | Viesselman |
| *52 | 3 | Business Law, II ..... | Jr., sr. | 51 |
| | | 9 MWF | 202MA | Viesselman |
| *54 | 3 | Latin American Relations.... | Jr., sr. | 6 credits |
| | | 9 MWF | 213MA | Schaper |
| *58 | 3 | Amer. Diplomatic Problems.. | Jr., sr. | 6 credits |
| | | 11 TThS | 213MA | Anderson |
| *59 | 3 | Municipal Corporations ..... | Jr., sr. | 6 credits |
| | | 11 TThS | 102MA | Anderson |
| | | *Special Courses* | | |
| 25 | 3 | American Govt. (Eng.) ..... | Jr., sr. | None |
| | | 8 TThS | 136ME | Viesselman |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 26 | 3 | Commercial Law (Eng.) .... | Jr., sr. | 25 |
| | | 8 TThS | 136ME | Viesselman |
| *56-57 | 3 | Teachers' Course ..... | Jr., sr. | See statement |
| | | 4 MW | Lib | Schaper |
| | | *Advanced Courses* | | |
| *101 | 3 | Constitutional Law ..... | Jr., sr., grad. | 6 credits |
| | | 9 MWF | 213MA | Schaper |
| *102 | 3 | Modern Political Thought.... | Jr., sr., grad. | 6 credits |
| | | 9 TThS | 102MA | Schaper |
| *104 | 3 | Political Parties ..... | Jr., sr., grad. | 6 credits or 1 and History 5-6 |
| | | See statement | | |
| *105 | 3 | Comparative Administration.. | Jr., sr., grad. | 6 credits |
| | | 10 MWF | 109MA | Arneson |
| *106 | 3 | Legislative Power & Methods | Jr., sr., grad. | 6 credits |
| | | 10 MWF | 102MA | Arneson |
| *108 | 3 | Police Power ..... | Jr., sr., grad. | 6 credits |
| | | See statement | | |
| *109 | 3 | Diplomacy ..... | Jr., sr., grad. | 6 credits or 1 and History 156 |
| | | 2 MWF | 213MA | Allin |
| *110 | 3 | International Law ..... | Jr., sr., grad. | 1 and 3 or 109 |
| | | 2 MWF | 102MA | Allin |
| *112 | 3 | Comparative Federal Govt... | Jr., sr., grad. | 6 credits |
| | | 11 TThS | 102MA | Allin |
| *114 | 3 | Govt. of the British Empire.. | Jr., sr., grad. | 6 credits or 1 and History 7 |
| | | 10 TThS | 102MA | Allin |

1a,b. AMERICAN GOVERNMENT. Organization and actual workings of the national government; nature and origin of the American governmental system. If possible, History 5-6 should accompany or follow this course. SCHAPER, ALLIN, ANDERSON, ARNESON, VIESSELMAN.

3. COMPARATIVE GOVERNMENT. The organization and working of the governments of the great European powers of today. ALLIN.

5. EUROPEAN MUNICIPAL ADMINISTRATION. A study of French, German, Austrian, and English cities; the forms of government, parties and elections; achievements in finance, police, sanitation, city planning and other public services undertaken. SCHAPER.

6. AMERICAN MUNICIPAL ADMINISTRATION. A study of the organization and chief functions of American cities; their growth, relation to the state, forms of charters, inefficiency and corruption, reform measures; and the administration of finance, police, health and other activities. SCHAPER.

7a,b. STATE AND LOCAL GOVERNMENT. Typical American state governments, special attention to Minnesota; relation of states to the United States and to local units; recent experiments such as the initiative and referendum, the recall, and primaries; social and economic legislation. ANDERSON, ARNESON, VIESSELMAN.

9. COLONIAL ADMINISTRATION. Not offered in 1916-17.

25. AMERICAN GOVERNMENT (Engineers). VIESSELMAN.

26. COMMERCIAL LAW (Engineers). VIESSELMAN.

*51. BUSINESS LAW, PART I. Principles of law governing ordinary business transactions. So much of the law taught as an educated man ought to know for guidance in every-day business affairs. General law of contracts, sales, mortgages, bankruptcy, and agency. VIESSELMAN.

*52. BUSINESS LAW, PART II. The law of partnerships, corporations, and negotiable instruments. VIESSELMAN.

*54. LATIN AMERICAN RELATIONS. A survey of the relations of the United States with the Latin-American nations; a comparative study of the constitutions, governments and recent progress of the leading Latin-American Republics. SCHAPER.

*56-57. TEACHERS' COURSE. Lectures on teaching Government in the secondary schools, given in coöperation with the Department of History and credited as part of History 56-57. SCHAPER.

*58. AMERICAN DIPLOMATIC PROBLEMS. Our foreign policy; the making and enforcing of treaties under the Constitution; the policy of isolation; the doctrine of neutrality; territorial expansion and boundary disputes; freedom of the seas; our relations with the Far East; arbitration. ANDERSON.

*59. MUNICIPAL CORPORATIONS. The legal basis of municipal government; the relation of the city to the state from the legal point of view; home rule; the city as a legal entity; municipal liability for torts; and kindred topics. ANDERSON.

*101. CONSTITUTIONAL LAW. Constitutional law, its origin and nature; American constitutions, how made and amended; the courts and the development of the Constitution; Federal and State relations; the Territories, their acquisition and government; citizenship. SCHAPER.

*102. MODERN POLITICAL THOUGHT. Nature and purpose of the modern state; sovereignty; the growth of democracy; the decline of individualism; increase of governmental activities; the great contributions to political thought from Hobbes, Locke, and Rousseau to the present time. SCHAPER.

*104. POLITICAL PARTIES. Not offered in 1916-17.

*105. COMPARATIVE ADMINISTRATION. Administration as a science; origin and development; analysis of the administrative systems of the United States, England, France, and Germany, with special reference to the law of officers, the merit system, and special administrative tribunals. ARNESON.

*106. LEGISLATIVE POWER AND METHODS. Source and scope of the legislative power; methods used by legislative bodies; current public questions; formulation and defense of legislative bills. ARNESON.

*108. THE POLICE POWER. Not offered in 1916-17.

*109. DIPLOMACY. The growth of international relations; the mode of conducting foreign affairs; diplomatic and consular service; the framing, interpretation, and termination of treaties and compacts. ALLIN.

*110. INTERNATIONAL LAW. Nature, sources, and sanction of international law; the status of nations, the rules of peace, neutrality, and war, and the arbitration movement. ALLIN.

*112. COMPARATIVE FEDERAL GOVERNMENT. Ancient and modern federal unions, especially the constitutions of the United States, Switzerland, Canada, and Australia, the South African Union, and the proposals for Imperial federation. ALLIN.

*114. THE GOVERNMENT AND POLICIES OF THE BRITISH EMPIRE. The origin, nature and operation of the British constitution, political parties and principles in Great Britain and the Colonies. ALLIN.

## RHETORIC AND PUBLIC SPEAKING

Professors JOSEPH M. THOMAS, MARGARET SWEENEY; Assistant Professors *DANIEL FORD, HALDOR GISLASON, CHARLES W. NICHOLS, SIDNEY F. PATTISON, ANNA H. PHELAN, FRANK M. RARIG, CHARLES E. SKINNER, HELEN A. WHITNEY; Instructors CECIL C. BEAN, ELBRIDGE COLBY, ELIZABETH HAWTHORN, GEORGE E. HEDGER, CYRIL A. HERRICK, JAMES T. HILLHOUSE, ELIZABETH JACKSON, MARTIN B. RUUD, SANDFORD M. SALYER, FRANK SMOYER, ARTHUR J. TIEJE, HOWARD T. VIETS; Assistant RAY M. WILCOX.

### REQUIREMENTS OF THE DEPARTMENT

*For a Major,* twenty-four credits, which may include not more than six credits in Public Speaking.

*For a Minor,* twelve credits in addition to Course 1-2, including Courses 11-12 or 15-16.

*For a Minor in Public Speaking,* twelve credits in Public Speaking.

*For B.A. with Honors.* The general requirements (page 24). A reading knowledge of either Latin, French, or German. At least fifteen credits in departmental starred courses, four of these credits to be in Course 119-120.

*For a Teacher's Certificate in English,* (a) English as the major subject of teaching: Rhetoric 1-2, either 11-12 or 15-16, and 41-42; English 1-2, and six additional hours, three of which are to be in courses numbered above 100. (b) English as a minor subject of teaching: Rhetoric 1-2, either 11-12 or 15-16; English 1-2, and at least three additional hours.

To be recommended, a student must secure an average of at least one and one-half honor points for each credit hour of all the work taken in the Departments of English and Rhetoric.

* Absent on leave 1916-17.

*For a Teacher's Certificate in Public Speaking,* a student must satisfy the Department that he is actively interested in some phase of Public Speaking either as a member of a literary or debating society, or as a participant in a contest or dramatic performance, or as a lecturer; must have the approval of the Department of Rhetoric and Public Speaking; and must complete the following courses: Rhetoric 1-2, 11-12 or 15-16, 41-42, and six additional hours in Public Speaking.

## COURSES

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| 1-2 | 6 | Composition and Rhetoric.... | | Fr. | None |
| | | 8 | MWF | To be assigned on registration | ¶ |
| | | 9 | MWF | To be assigned on registration | ¶ |
| | | 10 | MWF | To be assigned on registration | ¶ |
| | | 11 | MWF | To be assigned on registration | ¶ |
| | | 2 | MWF | To be assigned on registration | ¶ |
| | | 3 | MWF | To be assigned on registration | ¶ |
| | | 4 | MWF | To be assigned on registration | ¶ |
| | | 8 | TThS | To be assigned on registration | ¶ |
| | | 9 | TThS | To be assigned on registration | ¶ |
| | | 10 | TThS | To be assigned on registration | ¶ |
| | | 11 | TThS | To be assigned on registration | ¶ |
| 1b | 3 | Composition and Rhetoric.... | | Fr. | None |
| | | 11 | MWF | 304F | ¶ |
| | | 3 | MWF | 303F | ¶ |
| | | 11 | TThS | 311F | ¶ |
| 2a | 3 | Composition and Rhetoric.... | | Fr. | None |
| | | 11 | MWF | 304F | ¶ |
| | | 3 | MWF | 303F | ¶ |
| 3-4 | 6 | Composition for Engineers... | | Fr. Eng. | None |
| | | See program for the College of Engineering | | | |
| 11-12 | 6 | Exposition, Description, Narration ..... | | Soph., jr., sr. | 1-2 |
| | | 9 | MWF | 304F | Hillhouse |
| | | 11 | MWF | 306F | ¶ |
| | | 2 | MWF | 304F | ¶ |
| | | 9 | TThS | 311F | Ruud |
| | | 10 | TThS | 306F | Phelan |
| 15-16 | 6 | Exposition and Argument.... | | Soph., jr., sr. | 1-2 |
| | | 10 | MWF | 303F | Salyer |
| | | 11 | TThS | 303F | Tieje |
| 31 | 2 | Technical Writing ..... | | Sr. Eng. | 3-4 |
| | | See program for the College of Engineering | | | |
| 41-42 | 6 | Public Speaking ..... | | Soph., jr., sr. | 1-2 |
| | | 8 | MWF | 308F | Gislason |
| | | 2 | MWF | 308F | Wilcox |
| | | 8 | TThS | 308F | Wilcox |
| | | 9 | TThS | 308F | Gislason |
| | | 10 | TThS | 308F | Rarig |
| | | 11 | TThS | 308F | Wilcox |
| 41 | 3 | 9 | MWF | 308F | Rarig |
| 45-46 | 6 | Argumentation and Debate... | | Soph., jr., sr. | See statement |
| | | 10 | MWF | 308F | Gislason |
| 47 | 3 | Advanced Debate ..... | | ..... | See statement |
| | | Ar. | | 308F | Gislason and Rarig |

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| †80a | | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 3-4:30 | WF | 113Ed | Inglis |
| †80b | | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 3-4:30 | WF | 113Ed | Inglis |
| *81-82 | 6 | Interpretative Reading ..... | | Jr., sr. | 1-2, 41-42 |
| | | 11 | MWF | 308F | Rarig |
| *83-84 | 6 | Advanced Public Speaking... | | Jr., sr. | 1-2, 41-42 |
| | | 3 | MWF | 308F | Rarig |
| *102 | 3 | Versification ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 10 | TThS | 302F | Nichols |
| *103-104 | 6 | Studies in Structure and Style | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 2 | MWF | 311½F | Whitney |
| *107 | 3 | Imitative Writing ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 11 | MWF | 311F | Thomas |
| *110 | 3 | Short-story Writing ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 11 | MWF | 311F | Thomas |
| *111-112 | 6 | Essay Writing ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 11 | TThS | 302F | Pattison |
| *115-116 | 6 | Dramatic Technique ..... | | Sr., grad. | See statement |
| | | 1-3 | W and 2 F | 302F | Skinner |
| *119-120 | 4 | Seminar in Writing..... | | Sr., grad. | See statement |
| | | 2-4 | T | 302F | Thomas |
| *201-202 | 6 | Seminar in Rhetoric..... | | Sr., grad. | See statement |
| | | 2-4 | Th | 302F | Sweeney |

† Carries credit only in the Department of Education.

†1-2. COMPOSITION AND RHETORIC. Practical training in the art of writing; the principles of structure and analysis of specimens of good prose. THOMAS, SWEENEY, PATTISON, PHELAN, SKINNER, WHITNEY, BEAN, COLBY, HAWTHORN, HEDGER, HERRICK, HILLHOUSE, JACKSON, RUUD, SALYER, SMOYER, TIEJE.

†1b. COMPOSITION AND RHETORIC. Same as Course 1.

2a. COMPOSITION AND RHETORIC. Same as Course 2.

3-4. COMPOSITION FOR ENGINEERS. In the College of Engineering. NICHOLS, VIETS.

11-12. EXPOSITION, DESCRIPTION, AND NARRATION. Analysis of specimens; short themes and fortnightly essays, with emphasis on planning and amplification; informal exposition during the first half of the first semester, followed by description and narration. Number in each section limited to twenty. HILLHOUSE, PHELAN, RUUD, and .....

† All students taking Rhetoric 1-2 shall be regarded as on probation during the first four weeks of the course. At the end of that period those who have shown their inability to do satisfactory work because of *lack of preparation* shall be dropped from the course with a record of *failed*. To be eligible to enter the course again the next semester, such students must make up their deficiency in preparation by devoting at least three hours each week to regular instruction in this subject outside the college and must pass an examination given by the department. Until this examination is passed such students will not be permitted to carry more than fourteen hours of college work.

15-16. EXPOSITION AND ARGUMENT. Exposition during the first half of the first semester, followed by argument. The study of a text and the analysis of specimens, accompanied by weekly essays, and shorter themes. Number in each section limited to twenty. SALYER, TIEJE.

31-32. TECHNICAL WRITING. In the College of Engineering. NICHOLS.

80a,b. TEACHER'S COURSE. Methods of teaching English in high schools. Course of study, textbooks, and equipment; visits to Minneapolis and St. Paul high schools: theme-correcting. Open to juniors, seniors, and graduates, qualifying for *practice teaching*. Credit only in Education. INGLIS.

*102. VERSIFICATION. The nature of poetry and a detailed analysis of English meters and the various English verse forms. The theory accompanied by criticism of current poetry and practice in writing verse. NICHOLS.

*103-104. STUDIES IN STRUCTURE AND STYLE. Theory of structure and style; rhetorical analysis of standard English prose; themes based on personal observation, current reading, and investigation; preparation of essays with particular classes of readers in view. WHITNEY.

*107. IMITATIVE WRITING. The principles of structure, diction, and style, which underlie the work of leading English writers; application of these principles in both imitative and original compositions. THOMAS.

*110. SHORT-STORY WRITING. The technique of the short story accompanied by constructive work in story writing. THOMAS.

*111-112. ESSAY-WRITING. Practice in writing didactic, biographical, critical, informal essays. Extended composition. Two essays a semester. Individual aid in gathering of material, planning of papers, and criticism of essays. Analysis of a considerable body of modern essays. PATTISON.

*115-116. DRAMATIC TECHNIQUE. Principles of plotting, characterization, climax, dialog, and scenario-making. Writing of three plays—two original, one dramatized short story. Required readings, laboratory work, criticisms of local productions. Prerequisites: Courses 11-12 and 59-60 or 113-114 in English. SKINNER.

*119-120. SEMINAR IN WRITING. Open to advanced students who write with facility and who desire personal direction. Criticism of manuscripts submitted. Lectures on fundamental principles of English Composition. Open to seniors and graduates. Prerequisites: Courses 1-2, 11-12, and at least one other course. Required of Honors Course students. THOMAS.

*201-202. GRADUATE SEMINAR. (Open to seniors taking the Honors Course.) Lectures, discussions and reports. For 1916-17: study of critical theory beginning with Plato and Aristotle and emphasizing more important English and French writers. Prerequisites, Courses 1-2, 11-12, or 15-16, and at least one other course. SWEENEY.

## PUBLIC SPEAKING

*Honorable Mention in Public Speaking.* Students who have won honors in debate or oratory, if the department deems them worthy, may receive honorable mention on the commencement program. To be eligible for such distinction a student must (1) have represented his class in the freshman-sophomore debate, or won a place in the freshman-sophomore oratorical contest; (2) have taken part in an inter-society debate; (3) have represented the University in an intercollegiate debate, or won a place in the Pillsbury oratorical contest.

41-42. A General Course in 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. Each section limited to twenty-five. Rarig, Gislason, Wilcox.

45-46. Argumentation and Debating. Analysis, gathering of evidence, briefing. Critical study of models, including Lincoln-Douglas debates. Principles governing persuasive speaking applied in practice debates. Students in extension debating must register for this course to get credit for their work. Gislason.

47. Intercollegiate Debate and Oratory. The question for intercollegiate debate studied and briefed, and frequent practice debates held. Open to juniors and seniors who are awarded places on the intercollegiate debating squad. Gislason, Rarig.

*81-82. Interpretative Reading. The interpretation and expression of the various forms of literature, such as the essay, the short story, lyric and narrative poetry, and the drama. The aim is intelligent and sympathetic reading. Rarig.

*83-84. Advanced Public Speaking. The distinctive characteristics of oratorical style; analysis of the styles of representative orators. Written and extemporaneous speeches. Individual criticism and direction. Those desiring to prepare for the Pillsbury contest should register for this course. Rarig.

## ROMANCE LANGUAGES

Professors Everett W. Olmsted, Colbert Searles; Assistant Professors Jules Frelin, Ruth S. Phelps; Professorial Lecturers Paul d'Equilly Morin, Pedro Henríquez Ureña; Instructors Harry E. Atwood, Francis B. Barton, Nelson F. Coburn, Willis J. Plummer, Edward H. Sirich; Teaching Fellows George S. Barnum, Ellsworth Carlson.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits not including Course 1.

*For a Major,* twenty-four credits.

*For a B.A. with Honors,* general requirements (page 24); a reading knowledge of Latin or German and two years work in Spanish or Italian. In the Junior year, Courses 61-62, 63-64, 75-76, 101-102; in the Senior year, Courses 103-104, 107-108, 109-110, 115-116 (or 117-118). Substitutions for these courses may be granted by the Department in special cases. Alternation of courses required in the Junior and Senior years is allowable.

*For Major Recommendation for Teacher's Certificate,* in addition to Courses 1a and 3a, twenty-six credits.

*For Minor Recommendation for Teacher's Certificate,* in addition to Courses 1a and 3a, twelve credits in one Romance Language.

*Prerequisite for Teachers' Course,* in addition to Course 5-6, one Conversation-Composition Course and one Literary Course.

COURSES

| No. | Credits | Title | | Offered to | | Prereq. Courses |
|---|---|---|---|---|---|---|
| 1a | 6 | Beginning French ..... | | All | | None |
| | | 8 | MTWThFS | 201F | ¶ | |
| | | 9 | MTWThFS | 201F | ¶ | |
| | | 10 | MTWThFS | 227F | ¶ | |
| | | 11 | MTWThFS | 226F | ¶ | |
| 1b | 6 | Beginning French ..... | | All | | None |
| | | 10 | MTWThFS | 205F | ¶ | |
| | | 11 | MTWThFS | 227F | ¶ | |
| 2a | 3 | Beg. French (2nd half of 1a) | | All | | 1 year High School French |
| | | 9 | MWF | 227F | ¶ | |
| 3a | 6 | Intermed. French ..... | | All | | 1a or equiv. |
| | | 10 | MTWThFS | 205F | ¶ | |
| | | 11 | MTWThFS | 25F | ¶ | |
| 3b | 6 | Intermed. French ..... | | All | | 1a or equiv. |
| | | 8 | MTWThFS | 201F | ¶ | |
| | | 9 | MTWThFS | 201F | ¶ | |
| | | 10 | MTWThFS | 227F | ¶ | |
| | | 11 | MTWThFS | 226F | ¶ | |
| 4 | 6 | Survey French Lit..... | | All | | 3a or equiv. |
| | | 9 | MTWThFS | 227F | | Barton |
| 5-6 | 6 | Survey Fr. Lit. (year course) | | All | | 3a or equiv. |
| | | 9 | TThS | 202F | | Morin |
| | | 10 | TThS | 202F | | Phelps |
| | | 11 | TThS | 5F | | Atwood |
| | | 2 | MWF | 15F | | Sirich |
| 7-8 | 2 | Element. French Convers... | | All | | 3a or equiv. |
| | | 9 | MW | 202F | | Morin |
| | | 9 | TTh | 5F | | Barton |
| | | 3 | MW | 227F | | Frelin |
| 9-10 | 2 | Element. French Compos.... | | All | | 3a or equiv. |
| | | 9 | F | 202F | | Morin |
| | | 9 | S | 5F | | Barton |
| | | 3 | F | 227F | | Frelin |
| 31a | 6 | Beginning Spanish ..... | | All | | None |
| | | 9 | MTWThFS | 301F | | Plummer |
| | | 10 | MTWThFS | 109F | | Henríquez |
| 31b | 6 | Beginning Spanish ..... | | All | | None |
| | | 9 | MTWThFS | 226F | | Frelin |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 33-34 | 6 | Beginning Spanish (year-course) ..... | All | None |
| | | 8 TThS | 202F | Coburn |
| | | 11 MWF | 201F | Olmsted |
| | | 11 TThS | 205F | Plummer |
| 35a | 6 | Intermed. Spanish ..... | All | 31a or equiv. |
| | | See Statement | | |
| 35b | 6 | Intermed. Spanish ..... | All | 31a or equiv. |
| | | 9 MTWThFS | 15F | Plummer |
| | | 10 MTWThFS | 226F | Henríquez |
| 37-38 | 6 | Intermed. Span. (year-course) ..... | All | 31a or equiv. |
| | | 9 MWF | 110F | Coburn |
| | | 11 TThS | 110F | Henríquez |
| 39-40 | 6 | Span. Lit.: 19th Century... | All | 35a or equiv. |
| | | 9 MWF | 5F | Henríquez |
| 41-42 | 2 | Elemen. Spanish Convers.... | All | 35a or equiv. |
| | | 2 MW | 226F | Plummer |
| 43-44 | 2 | Elemen. Spanish Compos... | All | 35a or equiv. |
| | | 2 F | 226F | Plummer |
| 51-52 | 6 | Beginning Italian ..... | All | None |
| | | 3 MWF | 201F | Phelps |
| 53-54 | 6 | Represent. Italian Authors.. | Soph., jr., sr. | 51-52 or equiv. |
| | | 11 TThS | 201F | Phelps |
| 61-62 | 2 | Advanced French Convers.. | Sr., jr. | 7-8 or equiv. |
| | | 11 TTh | 202F | Morin |
| 63-64 | 2 | Advanced French Compos.. | Sr., jr. | 9-10 or equiv. |
| | | 11 S | 202F | Morin |
| 75-76 | 6 | French Lit.: 19th Century.. | Soph., jr., sr. | 5-6 or equiv. |
| | | 11 TThS | 15F | Barton |
| *101-102 | 6 | French Lit.: 18th Century.. | Jr., sr., grad. | 5-6 or equiv. |
| | | 11 MWF | 15F | Sirich |
| *103-104 | 6 | French Lit.: 17th Century.. | Jr., sr., grad. | 5-6 or equiv. |
| | | 10 MWF | 201F | Olmsted |
| *105-106 | 6 | French Lit.: 16th Century.. | Jr., sr., grad. | 101-102; 103-104 or equiv. |
| | | 11 MWF | Seminar | Searles |
| *107-108 | 4 | French Oral Diction..... | Jr., sr., grad. | 61-62 or equiv. |
| | | 10 MW | 202F | Morin |
| *109-110 | 2 | French Syntax ..... | Jr., sr., grad. | 63-64 or equiv. |
| | | 10 F | 202F | Morin |
| *111-112 | 4 | Lectures in French..... | Jr., sr., grad. | 5-6; 61-62 or equiv. |
| | | 2 MW | 202F | Morin |
| *113-114 | 4 | French Literature: Classicism | ..... | ..... |
| | | See Statement | | |
| *115-116 | 4 | French Lyric Poetry..... | Sr., grad. | 103-104 or equiv. |
| | | 11 TTh | Seminar | Searles |
| *117-118 | 4 | French Dramatic Lit..... | Sr., grad. | 103-104 or equiv. |
| | | 10 TTh | Seminar | Olmsted |
| *131-132 | 4 | Advanced Spanish Comp.... | Jr., sr., grad. | 41-42 or equiv. |
| | | 2 MW | 227F | Henríquez |
| *133-134 | 4 | Spanish Lectures ..... | Jr., sr., grad. | 43-44 or equiv. |
| | | 2 F | 227F | Henríquez |
| *135-136 | 2 | Spanish Novel | | |
| | | See statement | | |
| *151-152 | 4 | Dante, Petrarch, Baccaccio.. | Jr., sr., grad. | 51-52 or equiv. |
| | | 11 MW | 202F | Phelps |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *153-154 | 2 | Dante, Petrarch, Boccaccio.. (In English) | Jr., sr., grad. | 51-52 or equiv. |
| | | 11 F | 202F | Phelps |
| *161-162 | 2 | Teachers' Course ..... | Jr., sr., grad. | See above |
| | | 2 Th | 201F | Olmsted et al. |

NOTE: Course 7-8 may be taken only with 9-10. 9-10 may be taken separately. Course 41-42 may be taken only with 43-44. 43-44 may be taken separately. Course 61-62 may be taken only with 63-64. 63-64 may be taken separately. Course 151-152 may be taken only with 153-154. 153-154 may be taken separately. Courses 1a, 3a, 31a, 35a, 4, are double courses. Students are advised to take course 75-76 as a natural preparation for courses 101-102 and 103-104. Permission to register for courses from 75-76 to 161-162 inclusive may be granted by the department in special cases. Both semesters of any year course must be completed before credit is allowed for the first semester. The preceding statement applies also to courses 1a and 3a for freshmen and courses 31a and 35a for freshmen.

## INTRODUCTORY COURSES

### *French*

1a,b. BEGINNING FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar, oral exercises, and translation. ATWOOD, BARTON, COBURN, FRELIN, SEARLES, SIRICH.

2a,b. BEGINNING FRENCH. Second half of Course 1a. Open to students who have had one year of High School French or Beginning French in Summer Session. BARTON.

3a,b. INTERMEDIATE FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and reading of representative authors. ATWOOD, FRELIN.

4. SURVEY OF FRENCH LITERATURE. Same as 5-6, except that it is a second semester six-hour course. BARTON.

5-6. SURVEY OF FRENCH LITERATURE. This course will cover the whole period in historical outline and is a prerequisite for the courses devoted to special periods. ATWOOD, MORIN, PHELPS, SIRICH.

7-8. ELEMENTARY FRENCH CONVERSATION. A small amount of outside preparation will be required. The section meeting at nine o'clock on Monday and Wednesday is limited to students taking Course 5-6 and is based on the work of that course. BARTON, FRELIN, MORIN.

9-10. ELEMENTARY FRENCH COMPOSITION. BARTON, FRELIN, MORIN.

61-62. ADVANCED FRENCH CONVERSATION. The life and custom of Modern France accompanied by illustrative material. MORIN.

63-64. ADVANCED FRENCH COMPOSITION. MORIN.

75-76. FRENCH LITERATURE: NINETEENTH CENTURY. Discussions based on texts and collateral reading. BARTON.

### *Spanish*

31a,b. BEGINNING SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar, oral exercises, and translation. PLUMMER, HENRÍQUEZ.

33-34. BEGINNING SPANISH. This course is the same as Course 31a except that it is a year course meeting three times a week. BARNUM, COBURN, OLMSTED, PLUMMER.

35a,b. INTERMEDIATE SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and reading. PLUMMER, HENRÍQUEZ.

37-38. INTERMEDIATE SPANISH. This course is the same as Course 35a except that it is a year course meeting three times a week. COBURN, HENRÍQUEZ.

39-40. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Discussions based upon texts and collateral reading. HENRÍQUEZ.

41-42. ELEMENTARY SPANISH CONVERSATION. A small amount of outside preparation will be required. PLUMMER.

43-44. ELEMENTARY SPANISH COMPOSITION. Special attention given to social and commercial correspondence. PLUMMER.

### *Italian*

51-52. BEGINNING ITALIAN. Pronunciation, grammar, oral exercises, and translation. PHELPS.

53-54. REPRESENTATIVE ITALIAN AUTHORS. Ariosto, Tasso, Goldoni, Manzoni, Leopardi, Carducci. PHELPS.

## ADVANCED COURSES

### *French*

*101-102. FRENCH LITERATURE: EIGHTEENTH CENTURY. Discussions based upon texts and collateral reading. SIRICH.

*103-104. FRENCH LITERATURE: SEVENTEENTH CENTURY. Discussions based upon texts and collateral reading. OLMSTED.

*105-106. FRENCH LITERATURE: SIXTEENTH CENTURY. Discussions based upon texts and collateral reading. SEARLES.

*107-108. FRENCH ORAL DICTION. Dissertations orales sur des sujets variés. MORIN.

*109-110. FRENCH SYNTAX AND COMPOSITION. Special studies in characteristic problems of French Syntax. MORIN.

*111-112. LECTURES IN FRENCH. L'Exotisme dans la Littérature française. MORIN.

*113-114. FRENCH LITERATURE: CLASSICISM. (Not given during 1916-17).

*115-116. FRENCH LYRIC POETRY. Pro-seminar work. SEARLES.

*117-118. FRENCH DRAMATIC LITERATURE. Pro-seminar work. OLMSTED.

*Spanish*

*131-132. ADVANCED SPANISH COMPOSITION. Life and customs of Spain and Spanish America. HENRÍQUEZ.

*133-134. LECTURES IN SPANISH. La Civilización española e hispanoamericana. HENRÍQUEZ.

*135-136. SPANISH NOVEL. (Not given during 1916-17).

***Italian***

*151-152. DANTE, PETRARCH, AND BOCCACCIO. An introduction to the works of these authors. Reading in class, reports, and collateral reading. PHELPS.

*153-154. DANTE, PETRARCH, AND BOCCACCIO. Lectures and readings in English. Must be taken by those registered in 151-152; may be taken separately by other students. PHELPS.

*161-162. TEACHERS' COURSE. Lectures and discussions on methods, textbooks, etc. OLMSTED, et al.

## SCANDINAVIAN

Professors GISLE BOTHNE, ANDREW A. STOMBERG.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, not including Courses 1 and 5.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 24) and six credits of Scandinavian in addition to what is required for a major.

### COURSES

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 1 | 6‡ | Beginning Norwegian ..... | All | None |
| | | 8 MTWThFS | 206F ¶ | |
| 2 | 6 | Intermediate Norwegian ... | All | 1 |
| | | 8 MTWThFS | 206F ¶ | |
| 3-4 | 6† | Advanced Norwegian ..... | Soph., jr., sr. | 2 |
| | | 9 TThS | 206F | Bothne |
| 5 | 6‡ | Beginning Swedish ..... | All | None |
| | | 8 MTWThFS | F | Stomberg |
| 6 | 6 | Intermediate Swedish ..... | All | 5 |
| | | 8 MTWThFS | F | Stomberg |
| 7-8 | 6† | Advanced Swedish ..... | Soph., jr., sr. | 6 |
| | | 9 MWF | 206F | Stomberg |
| 9 | 2 | Beginning Norwegian ..... | See statement | None |
| 10 | 2 | Advanced Norwegian ..... | See statement | 9 |
| 11-12 | 3 | Norwegian Literature ..... | See statement | 10 |
| | | 4 & 5 T | 206F | Bothne |
| *101-102 | 6† | Modern Norwegian Liter... | Jr., sr. | 3-4 |
| | | 10 TThS | 206F | Bothne |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| *103 | 3 | Earlier Norwegian Liter.... | Sr., grad. | 101-102 |
| | | 11 TThS | 206F | Bothne |
| *104 | 2 | Henrik Ibsen ..... | Sr., grad. | 101-102 |
| | | 11 TTh | 206F | Bothne |
| *105-106 | 6 | History of Northern Europe | Jr., sr., grad. | See statement |
| | | 11 MWF | 206F | Stomberg |
| *107-108 | 6† | Swedish Literature ..... | Jr., sr., grad. | 7-8 |
| | | 2 MWF | 206F | Stomberg |
| *109 | 2 | Strindberg ..... | Sr., grad. | 107-108 |
| | | Ar. Ar. | 206F | Stomberg |
| *110 | 2 | Teachers' Course in Norwegian ..... | Sr., grad. | 3-4 |
| | | 4 &5 Th | 206F | Bothne |
| *113-114 | 4 | Old Norse (Icelandic)..... | Sr., grad. | See statement |
| | | Ar. Ar. | 206F | Bothne |
| *116 | 2 | Teachers' Course in Swedish | Sr., grad. | 7-8 |
| | | Ar. Ar. | 206F | Stomberg |

† Both semesters must be completed before credit is given for the first semester.

‡ Freshmen must complete intermediate course before credit is given for beginning course.

1. Beginning Norwegian. Grammar, composition, select readings in easy prose and poetry. Bothne.

2. Intermediate Norwegian. Grammar, composition, conversation, elementary history of literature, and select works of modern authors. Bothne.

3-4. Advanced Norwegian. Prose and poetry. Bothne.

5. Beginning Swedish. Grammar and composition; select readings in easy prose and verse. Stomberg.

6. Intermediate Swedish. Grammar, composition, and conversation; prose texts. An elementary study of the literature of Sweden and reading of Tegner's *Fritiofs Saga*. Stomberg.

7-8. Advanced Swedish. Prose and poetry. Stomberg.

9 Beginning Norwegian. Grammar, composition, select readings in easy prose and poetry. Not offered in 1916-17.

10. Advanced Norwegian. Grammar, composition, conversation, elementary history of literature, and select works of modern authors. Not offered in 1916-17.

11-12. Norwegian Literature. A survey. This course is open to teachers and mature students. Bothne.

*101-102. Modern Norwegian Literature. Norwegian literature from 1814 to the present day. Bothne.

*103. Earlier Norwegian Literature. History of literature. Norwegian and Danish folk-songs, Holberg, Oplysningstiden. Bothne.

*104. Ibsen. Lectures, reading, and interpretation. Bothne.

*105-106. HISTORY OF NORTHERN EUROPE. History of the Scandinavian countries from the earliest period to recent times. Prerequisites: Courses 3-4 or 7-8, or Courses 1-2, 3-4, or 14 in History. Knowledge of Scandinavian languages not required. STOMBERG.

*107-108. SWEDISH LITERATURE. History of Swedish literature from 1710 to the present time. History of the literature and study of modern authors, including Selma Lagerlöf, Geijerstam, Strindberg. STOMBERG.

*109. STRINDBERG. Lectures, reading, and interpretation. STOMBERG.

*110. TEACHERS' COURSE IN NORWEGIAN. For students who expect to teach Norwegian in the high schools. BOTHNE.

*113-114. OLD NORSE (ICELANDIC). Grammar and reading. Gunnlaugs Saga Ormstungu. BOTHNE.

*116. TEACHERS' COURSE IN SWEDISH. For students who expect to teach Swedish in the high schools. STOMBERG.

## SOCIOLOGY AND ANTHROPOLOGY

Professors ALBERT ERNEST JENKS, ARTHUR J. TODD; Assistant Professor JOSEPH PETERSON; Instructor PAUL I. NEERGAARD; Lecturers FRANK J. BRUNO, OTTO W. DAVIS, CHARLES C. STILLMAN, GEORGE EDGAR VINCENT; Superintendents of State Board of Control Institutions.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* see general requirements (page 24).

*For Recommendation for Teaching,* credits in the following courses: 1, 4, 6, and two advanced courses.

Modern university education is not complete unless the graduate has obtained the social point of view. To this end the Department offers elementary courses dealing with peoples, with social forces, institutions, and movements. Its more advanced courses are designed especially for students majoring in the Social Sciences; namely, Sociology and Anthropology, Economics, History, and Political Science.

### COURSES

| No. | Credits | Title | | Offered to | Prereq. Courses |
|---|---|---|---|---|---|
| | | *Introductory Courses* | | | |
| 1a | 3 | General Introduction ..... | | Soph., jr., sr. | None |
| | | 8 | MWF | 203He(F) | Neergaard |
| | | 10 | MWF | 9F | Jenks |
| | | 10 | TThS | 9F | Todd |
| | | 2 | MWF | 301F | Neergaard |
| 1b | 3 | 2 | MWF | 301F | Neergaard |

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| 4 | 3 | Cult. Anthropology ..... | Soph., jr., sr. | 1a or 1b |
| | | 2 MWF | 9F | Jenks |
| 6 | 3 | Soc. Reform Movements.. | Soph., jr., sr. | 1a or 1b |
| | | 11 TThS | 9F | Todd |
| | | *Special Courses* | | |
| 7 | None | Studies in Soc. Psychology | Stud. in dept. | None |
| | | See Statement | | Vincent |
| | | *General Courses* | | |
| 9 | 3 | Treatment of Dependents and Defectives ..... | Jr., sr. | 1 |
| | | 8 TThS | 9F | Bruno |
| *10 | 3 | Child Welfare ..... | Jr., sr. | 1 and 9 |
| | | 8 TThS | 9F | Stillman |
| *11 | 2 | Housing Problems..... | Jr., sr. | 1 and one other |
| | | 8 MW | 9F | Davis |
| *12 | 3 | Ethnology ..... | Jr., sr. | 1 and one other |
| | | See Statement | | Jenks |
| 14 | 3 | Rural Community ..... | Jr., sr. | 1 |
| | | 8 MWF | 203He(F) | Neergaard |
| 21-22 | 1 | Field Work ..... | Jr., sr. | See statement |
| | | Ar. Ar. | Ar. | Ar. |
| | | *Advanced Courses* | | |
| *102 | 3 | Social Theory ..... | Jr., sr., grad. | 1, 9 or 10, & 1 other |
| | | 9 TThS | 9F | Neergaard |
| *104 | 2 | State Care of Dep., Def., and Delinquents ..... | Jr., sr., grad. | 1, 9 or 10, & 1 other |
| | | 3, 4 F | 9F | Todd and State experts |
| *106 | 3 | Treatment of Delinquents. | Jr., sr., grad. | 1, 9 or 10, & 1 other |
| | | 9 MWF | 9F | Todd |
| *108 | 3 | Philippine People ..... | Jr., sr., grad. | 1 and one other |
| | | 10 MWF | 9F | Jenks |
| *110 | 3 | Physical Anthropology ... | Jr., sr., grad. | See statement |
| | | 2 MWF | 9F | Jenks |
| *112 | 3 | American Negro ..... | Jr., sr., grad. | 1, 12 or 113, & 1 other |
| | | See Statement | 9F | Jenks |
| *113 | 3 | American People ..... | Jr., sr., grad. | 1 and two others |
| | | 11 MWF | 9F | Jenks |
| *114 | 3 | American People (cont'd). | Jr., sr., grad. | 1, 113, and one other |
| | | 11 MWF | 9F | Jenks |
| *117 | 3 | Social Psychology ..... | Jr., sr., grad. | See statement |
| | | 9 TThS | 311½F | Peterson |
| *119 | 3 | The Family ..... | Jr., sr., grad. | 9 credits |
| | | 11 TThS | 9F | Todd |
| *120 | 3 | Social Progress ..... | Sr., grad. | See statement |
| | | 10 TThS | 9F | Todd |
| *121-122 | 2(each) | Seminar in Sociology..... | Sr., grad. | For sr. four correlated courses |
| | | See Statement | 9F | Todd |
| *123 | 3 | Seminar in Anthropology. | Sr., grad. | For sr. four correlated courses |
| | | 2, 3 Th | 205Lib. | Jenks |

## INTRODUCTORY COURSES

1a,b. GENERAL INTRODUCTION. Elemental activities, institutions, laws, and theories. Especial emphasis placed on descriptive data. Textbook and lectures. JENKS,* NEERGAARD, TODD.*

4. CULTURAL ANTHROPOLOGY. Origin and development of the most important activities and institutions which have had their beginning in primitive society. Textbook, lectures, readings, and essay. JENKS.

6. MODERN SOCIAL REFORM MOVEMENTS. A survey of the attempts to overcome certain social maladjustments: child labor, the city, the tenement, poverty, degeneracy; movements for public health, old age pensions, social insurance, the protection of infancy and youth, public recreation, etc. TODD.

## SPECIAL COURSES

7. STUDIES IN SOCIAL PSYCHOLOGY. President George E. Vincent will deliver the following course of five public lectures to the students of the Department:

1. The Individual and the Group
2. Group Conflict and Rivalry
3. Group Coercion
4. Folkways and Mores
5. The Psychology of Leadership.

Not given in 1916-17. VINCENT.

## GENERAL COURSES

9. TREATMENT OF DEPENDENTS AND DEFECTIVES. The extent and nature of poverty and mental defectiveness; efforts made for their amelioration and prevention. BRUNO.

*10. CHILD WELFARE. Study of social obligations to the child; development of the child-saving movement in the United States; infant and child mortality, recreation, education; courts, institutions, societies, and other public efforts for the child. STILLMAN.

*11. HOUSING PROBLEMS. An examination of housing evils and their causes; the various movements for the prevention or improvement of bad housing; town planning; garden cities. Lectures, readings, field work, and essay. DAVIS.

*12. ETHNOLOGY. The different so-called races of men; their historical classifications; causes of origin and distribution; important ethnic problems. Textbook, lectures, assigned readings, and essay. Not given in 1916-17. JENKS.

14. THE RURAL COMMUNITY. A survey of the field of Rural Sociology; description of rural social interests; analysis of fundamental prob-

* First semester only.

lems of rural life; nature and influence of rural environment; characteristics of rural mind. NEERGAARD.

21-22. FIELD WORK. Under personal supervision of some member of the Department. Open to properly equipped students. Members of the Department.

ADVANCED COURSES

*102. SOCIAL THEORY. The foundations of sociology; the leading American, English, French, and German writers and their methods of approach to the science and the leading results they have secured. Text books, readings, lectures, essay. NEERGAARD.

*104. STATE CARE OF DEPENDENTS, DEFECTIVES, AND DELINQUENTS IN MINNESOTA. Organization, machinery, and function of such institutions as the State Hospitals, Asylums, Training Schools, Prison, Schools for the Feeble-Minded, the Blind, and the Deaf. Lectures and readings. TODD, and Experts from the Institutions.

*106a. TREATMENT OF DELINQUENTS. The causes of crime; nature of the criminal; criminal procedure; methods of treatment (prisons, reformatories, parole, probation); the juvenile offender; juvenile courts; preventive methods. TODD.

*108. THE PHILIPPINE PEOPLE. Comparative study of the four large ethnic and cultural groups of people in the Philippine Islands; policy of the insular government as it affects American home interests in the Orient. Lectures, readings, and essay. JENKS.

*110. PHYSICAL ANTHROPOLOGY. Theory of evolution as applied to natural and cultural man; theory of eugenics and its application. Prerequisites: courses 1, 4 (or course 1-2 in Animal Biology), and one other course in Sociology and Anthropology. Lectures, readings, and essay. JENKS.

*112. THE AMERICAN NEGRO. The negro in Africa; development of the American negro; present characteristics, conditions, developing tendencies, and probable future of the American negro. Lectures, readings, and essay. Not given in 1916-17. JENKS.

*113. THE AMERICAN PEOPLE. Dominant characteristics of the diverse foreign peoples now in the United States; their modification in America; the importance of these peoples to the American nation. Lectures, readings, and essay. JENKS.

*114. THE AMERICAN PEOPLE (continued). A continuation of course 113. Essential and unique historical Americanisms, and their value and virility for the future; facts and forces of amalgamation and assimilation in America; America's ethnic problems. Lectures, readings, and essay. JENKS.

*117. SOCIAL PSYCHOLOGY. An introduction to the study of reciprocal in-

fluence of minds in society. (Same as course 107 in the Department of Philosophy and Psychology.) Prerequisites: course 1 and one other course, and course 1-2 or 5 in Philosophy and Psychology. PETERSON.

*119. THE FAMILY. A study of the historical development of forms of the family, and their relation to other social institutions. The modern family, its functions, and its problems. TODD.

*120. SOCIAL PROGRESS. A critical study of various theories of progress and a review of social institutions and conditions that are supposed to favor or hinder social progress. Prerequisites: three courses including 117 (or philosophy and psychology 13, or education 3a). Not open to students having previously taken course 119. TODD.

*121-122. SEMINAR IN SOCIOLOGY. An advance course of method and independent research. Not given in 1916-17. TODD.

*123. SEMINAR IN ANTHROPOLOGY. An advanced course of method and independent research.

## COURSES IN OTHER DEPARTMENTS OF THE UNIVERSITY OPEN TO JUNIORS OR SENIORS OF THIS COLLEGE

### COLLEGE OF AGRICULTURE

#### *First Semester*

Agricultural Chemistry
Course 3 (3) 8:55 to 9:40 MWF

Agricultural Economics
Course 251-2 (6) Ar

Agricultural Education
Course 151a (3) 10:45-11:30 MWF

Agronomy (3)
Course 1 Lecture 8:00-8:45 ThS
Course 1 Lab. 8:00-9:40 T

Dairy and Animal Husbandry
Course 1a (3) 8:00-9:40 MWF
Course 11 (3) 8:00-8:45 MWF
Course 26a (3) 8:00-9:40 TThS

Economic Zoology
Course 5 8-8:45 TThS A(F) Lab. 2-4:30 A(F) 306
Course 7 (3) Ar
Course 9 (3) Ar
Course 101 (3) Ar
Course 103a (4) Ar

Horticulture
Course 71 (3) 8:55-9:40 MWF
Course 90a (3) 8:55-9:40 MWF

Journalism
Course 7-8 (6)
Course 9 (3)

Plant Pathology and Botany
Course 1 (3) 2:00-4:30 WF
Course 103 (3) Ar

#### *Second Semester*

Agricultural Chemistry
Course 3b (3) 8:55-9:40 MWF
Course 4 (3) 8:00-9:40 TThS

Agricultural Economics
Course 18 (3) Lec. 9:50-10:35 M; Quiz 8:55-9:40 WF; 9:50-10:35 WF
Course 251-2 (6) Ar

Agricultural Education
Course 151b (3) 10:45-11:30 MWF

Agronomy
Course 1b (3) Lec. 8:00-8:45 ThS; Lab. 8:00-9:40 T

Dairy and Animal Husbandry
Course 1b (3) 8:00-9:40 MWF
Course 26b (3) 8:00-9:40 TThS
Course 30 (2) Ar

Economic Zoology
Course 8 (3) Ar
Course 102 (3) Ar
Course 103b (4) Ar

Horticulture
Course 50 (3) 9:50-10:35 TTh; Lab. 2:00-4:30 F
Course 56 (1) 9:50-10:35 MWF
Course 90b (3) 8:55-9:40 MWF

Journalism
Course 7-8 (6)
Course 14 (3)

Plant Pathology and Botany
Course 104 (3) Ar

## LAW SCHOOL

*First Semester*

Contracts (4) 8:00 MTFS; 9:00 MTFS
Carriers (2) 10:00 ThF; 11 ThS
Personal Property (3) 11:00 MTW; 2:00 MTW

*Second Semester*

*Contracts (3)
*Agency (3)

* Open only to students who have taken contracts in the first semester.

## SCHOOL OF MINES

*First Semester*

Metallurgy
Course 4 8:00 WThF
Course 2 8:00-4:00 M; 11:00 TWThF
Course 106 9:00 WThFS
Course 154 Ar

*Second Semester*

Metallurgy
Course 4 8:00 WThF
Course 2 8:00-4:00 M; 11:00 TWThF
Course 106 9:00 WThFS
Course 154 Ar

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# Bulletin of The University of Minnesota

# THE COLLEGE OF ENGINEERING AND ARCHITECTURE

## 1916-1917

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## 1916

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| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
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| 31 | .. | .. | .. | .. | .. | .. |

## 1917

### JANUARY

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### FEBRUARY

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### MARCH

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### APRIL

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### MAY

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### JUNE

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### JULY

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### AUGUST

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| November | 22 | Wednesday | Medical School second quarter begins |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |

| | | | |
|---|---|---|---|
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second Semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 11 | Monday | Senior Class Day exercises |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

*Schedule of Condition Examinations for Students of the College of Engineering and Architecture*

| September, 1916 | | | April, 1917 | |
|---|---|---|---|---|
| Tuesday, 19, | a.m. | Physics ..... | a.m. Monday, | 16 |
| | p.m. | Chemistry, Geology..... | p.m. | |
| Wednesday, 20, | a.m. | Mathematics and Mechanics ..... | a.m. Tuesday, | 17 |
| | p.m. | Drawing and Descriptive Geometry ..... | p.m | |
| Thursday, 21, | a.m. | Civil Engineering..... | a.m. Wednesday, | 18 |
| | p.m. | Experimental Engineering, Shop..... | p.m. | |
| Friday, 22, | a.m. | Mechanical Engineering. | a.m. Thursday, | 19 |
| | p.m. | Electrical Engineering, Architecture ..... | p.m. | |
| Saturday, 23, | a.m | Rhetoric, Language..... | a.m. Friday, | 20 |

Morning examinations are at nine o'clock, afternoon examinations at two o'clock.

Condition examinations are ordinarily held in the classrooms of the respective departments. Students purposing to take such examinations are to notify the department concerned in advance, and make all arrangements with the particular instructor. Where conflicts occur in examination periods, arrangements should be made with the instructors concerned for a new schedule of time.

Certificates authorizing condition examinations are secured in advance from the Registrar; the fee is one dollar. Condition examinations at times other than those scheduled require faculty authorization as Special Examinations, and involve a fee of five dollars.

# THE COLLEGE OF ENGINEERING AND ARCHITECTURE

## FACULTY

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MAURICE B. LAGAARD, C.E., Assistant in Experimental Engineering 3308 19th Ave. S.
PERCIVAL W. VESSELMAN, M.A., LL.B., Assistant in Political Science

## SPECIAL LECTURERS IN ELECTRICAL ENGINEERING

R. A. LUNDQUIST, E.E., Consulting Engineer
"Preliminary Engineering and Materials of Construction for Transmission Lines"
"Methods of Construction of Transmission Lines"
FRED DUSTIN, Former Electrical Inspector, City of Minneapolis
"Practical Operation of the Rules for Safe Electrical Construction"
P. G. DOWNTON, Electric Storage Battery Company
"Electric Vehicles and Batteries"

# GENERAL INFORMATION

## THE PURPOSES OF THE COLLEGE

The College of Engineering and Architecture was founded in accordance with the laws of the State of Minnesota and of the Federal Government, its object being "to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." It offers courses of study, of five years each, in Civil, Mechanical, and Electrical Engineering, and Architecture, leading to the degrees of Civil, Mechanical, and Electrical Engineer, and Architect. The degrees of Bachelor of Science in Engineering, and Bachelor of Science in Architecture, are conferred at the end of the fourth year. This college also offers work in the Graduate School leading to the degree of Master of Science.

## ENGINEERING FOR MANUFACTURERS, CONTRACTORS, AND ADMINISTRATORS

The four-year course in General Engineering, leading to the degree of Bachelor of Science in Engineering, is excellent preparation for careers in certain business fields akin to engineering. These semi-engineering activities in part are: The operation of such public utilities as light and power plants, traction companies, railway and irrigation systems; the management of manufacturing establishments such as automobile factories, locomotive works, flour and saw mills; the direction of construction in contracting work; salesmanship in the materials of construction, including water wheels, electrical and other machinery.

The course includes the mathematics, shop work, physics, mechanics and chemistry of the standard Engineering Course. It includes liberal electives for such specialized work as will serve to fit men for the particular fields anticipated. Such subjects as Economics, Sociology, Psychology, Business Management, Accounting Principles, Banking, Public Utilities, and Business Law may be taken as supplementary to the technical subjects.

## EXTENSION WORK

Extension courses are offered in Architecture and Engineering. For definite information regarding extension work attention is directed to the Bulletin of the General Extension Division of the University.

## ENTRANCE REQUIREMENTS

The entrance requirements of the College of Engineering are given in detail beginning page 11 of this Bulletin.

## SPECIAL STUDENTS

In exceptional cases applicants are admitted to the college to pursue, under the direction of the Faculty, one or two lines of study, selected from some regular course. Such students must be of mature years, and shall give satisfactory evidence of ability to do with credit the work applied for. Admission to the college of students of this class requires in each specific case a vote of the Faculty.

## 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.

## CREDIT HOUR

A *credit hour* refers to a unit of time as part of a week's work. One credit hour means three actual hours of work each week. If a one credit hour subject is presented in a recitation period, it is assumed that the student will give two hours to the preparation of this hour of class room work. Where the subject is given in laboratory, shop or drafting room, the time spent by the student in class is three actual hours for each credit hour.

A *semester credit hour* is one credit hour a week extending through a semester.

A *year credit hour* is one credit hour a week extending through the college year.

## FEES AND EXPENSES

The annual fee for students in this college is sixty dollars. See Bulletin of General Information, page 40 for details. For statements of the cost of living, see page 43.

## SCHOLARSHIPS AND PRIZES

For scholarships and prizes in this college, see pages 47-51 of the Bulletin of General Information. Special attention is called to the Free and Service Scholarships mentioned on page 48 of the Bulletin of General Information.

## THESES

Every candidate for the degree of Engineer or Architect is required to prepare a thesis on some subject particularly relating to his course. The thesis must embody the result of some research made by him, a special design, or an original report upon some engineering or architectural problem. It must be creditable from a literary, as well as from a technical, point of view.

The subject of the thesis and the character of the work to be done will be suggested in a large measure by the course of study pursued by

the student. Great emphasis is laid upon the careful and accurate preparation of a thesis, because, more than any other work the student does, this certifies to his ability to undertake the difficult and responsible duties involved in the direction of engineering, architectural, and industrial interests.

## CHANGES IN BULLETIN

The Faculty of the College of Engineering and Architecture reserves the right 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.

## ENTRANCE REQUIREMENTS

1. English .....Three units
2. Mathematics .....Three units
3. Chemistry .....One unit
4. Enough additional work to make in all fifteen units, of which not more than three acceptable units may be in Group F.

One unit may be accepted in lieu of one unit from the above required subjects, but if this be offered as a substitute for Mathematics or Chemistry the resulting deficiency must be removed as hereinafter provided. Unless a candidate offers two units from Group B he may be required to take language in course. Students looking forward to the study of Architecture will find it to their advantage to take freehand drawing in the high school, to elect French as a language, and to cover the field of general history as far as possible.

## 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 period of thirty-six weeks. In manual subjects and kindred courses, it means the equivalent of ten recitation periods per week for thirty-six weeks.

GROUP A. ENGLISH: three or four units.

GROUP B. LANGUAGES: Latin, Greek, German, French, Spanish, Scandinavian, one to four units each.

GROUP C. HISTORY AND SOCIAL SCIENCES: Ancient and Modern History, one unit each; English and Senior American History, one-half unit each; American Government, Economics, Economic History of England, and Economic History of the United States, one-half unit each; Commercial Geography, and History of Commerce, one-half or one unit each.

GROUP D. MATHEMATICS: Elementary Algebra and Plane Geometry, one unit each; Higher Algebra, Solid Geometry, and Trigonometry, one-half unit each.

GROUP E. NATURAL SCIENCES: Physics and Chemistry, one unit each;

Botany and Zoology, one-half or one unit each; Physiology, Astronomy, Geology, and Physiography, one-half unit each.

GROUP F. VOCATIONAL SUBJECTS: Business Law and Business Arithmetic, one-half unit each; Elementary and Advanced Bookkeeping, one unit each; Stenography and Typewriting, one or two units. Freehand Drawing, Mechanical Drawing, and Shopwork, one or two units each. Agriculture, one to four units. Normal Training subjects, one to three units, provided the applicant has had one year of subsequent teaching experience.

## DEFICIENCIES

Students found deficient in Algebra at the end of the first four weeks are separated from the regular freshman mathematics class and given a special course in Algebra, Trigonometry, and Analytics, extending throughout the year, and equivalent to the first semester freshman mathematics.

Should an entrance deficiency occur in Solid Geometry this must be made up prior to the beginning of the second semester; otherwise entrance deficiencies must be removed before entering upon any work of the sophomore year.

# COURSES OF STUDY

## CIVIL, MECHANICAL, ELECTRICAL, AND GENERAL ENGINEERING

The freshman year is the same for all Engineering and General or Business Courses. The freshman year for Architecture is given on page 24.

### FRESHMAN YEAR*

*First Semester*

Mathematics 71a, Algebra and Trigonometry, 5
Drawing 1, 3, Engineering Drawing and Descriptive Geometry, 3
Rhetoric 3, Rhetoric and Composition, 3
Chemistry 25, Chemistry for Engineers, 3
Mechanical Engineering 1, Elementary Shop Practice, 2
Technology, 1
Military Drill, 1

*Second Semester*

Mathematics 72, Analytical Geometry, 5
Drawing 2, 4, Engineering Drawing and Descriptive Geometry, 3
Rhetoric 4, Rhetoric and Composition, 3
Chemistry 26, Chemistry for Engineers, 3
Mechanical Engineering 2, Elementary Shop Practice, 2
Technology, 1
Military Drill, 1
Summer Reading (optional), 1

All students pursuing the above courses register for Engineering Mathematics 71a in the first semester. At the end of two weeks' trial those who, by reason of inadequate preparation or undeveloped mathematical insight, are judged unable to carry the work successfully, are re-registered in Engineering Mathematics 69-70, in which the intensive work of Engineering Mathematics 71a is expanded into a course covering the full year. The resulting deficiency in Engineering Mathematics 72 must be made up in the Summer School.

## CIVIL ENGINEERING

### SOPHOMORE YEAR

*First Semester*

Engineering Mathematics 73a, Differential Calculus, 5
Physics 7, General Physics, 4

*Students who expect to take the General Course in Engineering and specialize in architectural work, should register for Drawing 9 and 10 instead of Drawing 3 and 4.

Physics 9, General Laboratory Practice, 1
Drawing 5, Drafting, 2
Civil Engineering 1, Surveying, 3
Approved Elective, 3
Military Drill, 1

*Second Semester*

Engineering Mathematics 74, Integral Calculus, 5
Physics 8, General Physics, 4
Physics 10, General Laboratory Practice, 1
Drawing 6, Drafting, 2
Civil Engineering 2, Surveying, 3
Approved Elective, 3
Military Drill, 1

JUNIOR YEAR

*First Semester*

Engineering Mathematics 75, Technical Mechanics, Statics, 3
Engineering Mathematics 151, Mechanics of Materials, 3
Experimental Engineering 101, Materials Testing Laboratory, 2
Civil Engineering 51, Stresses in Structures, 3
Civil Engineering 91, Highways and Pavements, 2
Civil Engineering 3, Surveying, 2
Approved Elective, 3

*Second Semester*

Engineering Mathematics 76, Technical Mechanics, Dynamics, 3
Engineering Mathematics 152, Hydraulics, 3
Experimental Engineering 102, Hydraulic and Steam Laboratory, 2
Civil Engineering 52, Elementary Structural Design, 2
Civil Engineering 92, Municipal Engineering, 3
Civil Engineering 4, Surveying, 2
Approved Elective, 3

SUMMER CAMP

Civil Engineering 6, Summer Camp in Surveying, 6.

Summer Camp in Surveying is held during the vacation period preceding the senior year, and is in session five weeks.

SENIOR YEAR

*First Semester*

Civil Engineering 121, Hydrology, 3
Civil Engineering 103, Water Supply, 3
Civil Engineering 111, Railway Engineering, 3
Civil Engineering 151, Bridge Analysis, 3

Civil Engineering 157, Reinforced Concrete, 3
Approved Elective, 3

*Second Semester*

Civil Engineering 122, Water Power, 3
Civil Engineering 104, Sanitary Engineering, 3
Civil Engineering 152, Bridge Design, 3
Electrical Engineering 156, Electric Power, 3
Approved Technical Elective, 3
Approved Elective, 3

POST-SENIOR YEAR

Thesis required, and additional work each semester to aggregate eighteen credit hours. The electives of the post-senior year must be selected in advance in an approved logical order of groupings which will develop intensively the specialized fields of Engineering studied. The thesis also should bear on the general field covered by the electives, and extends through the year.

The following arrangements are presented as suggestions, but in no wise limit the combinations which may be chosen.

GENERAL

*First Semester*

Civil Engineering 155, Structural Design, 3
Civil Engineering 123, Hydraulic Design, 3
Experimental Engineering 113, Concrete Laboratory, 3
Electrical Engineering, 3
Rhetoric 31, Technical Writing, 3
Thesis, 3

*Second Semester*

Civil Engineering 174, Sanitary Engineering, 3
Civil Engineering 124, Hydraulic Design, 4
Civil Engineering 158, Reinforced Concrete Design, 3
or
Experimental Engineering 114, Structural and Concrete Laboratory, 3
Public Speaking, 3
Thesis, 3

STRUCTURAL

*First Semester*

Civil Engineering 155, Structural Design, 3
Civil Engineering 159, Advanced Theory of Structures, 3
Experimental Engineering 113, Concrete Laboratory, 3
Logic, 3
Rhetoric 31, Technical Writing, 3
Thesis, 3

*Second Semester*

Civil Engineering 156, Structural Design, 3
Civil Engineering 160, Advanced Theory of Structures, 4
Experimental Engineering 114, Structural and Concrete Laboratory, 3
Public Speaking, 3
Thesis, 5

MUNICIPAL

*First Semester*

Civil Engineering 171, City Planning, 3
Civil Engineering 173, Building Sanitation, 3
Zoology 1, Biology, 3
Chemistry 109, Water Analysis, 3
Engineering Mathematics 153, Thermodynamics, 3
Thesis, 3

*Second Semester*

Civil Engineering 174, Sanitary Design, 3
Experimental Engineering 106, Experimental Laboratory, 3
Bacteriology 58b, General Bacteriology, 4
Mechanical Engineering 127b, Power Plant Design, 3
Thesis, 5

RAILWAYS

*First Semester*

Civil Engineering 113, Railway Engineering, 3
Civil Engineering 155, Structural Design, 3
Electrical Engineering, 3
Mechanical Engineering 129, Steam Engines and Boilers, 3
Economics 145, Modern Business Corporations, 3
Thesis, 3

*Second Semester*

Civil Engineering 114, Railway Engineering, 3
Metallurgy 158, Metallography for Engineers, 3
Experimental Engineering 114, Structural and Concrete Laboratory, 3
Mechanical Engineering 138, Contracts and Specifications, 1
Economics 74, Railway Problems, 3
Thesis, 5

# MECHANICAL ENGINEERING

For freshman year, see page 13

## SOPHOMORE YEAR

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Eng. Math. 73a, Differential Calculus | 5 | 45 | 5 | ..... | ..... | 10 |
| Physics 7, General Physics | 4 | 52 | 3 | 1 | ..... | 8 |
| Physics 9, General Lab. Practice | 1 | 52 | ..... | ..... | 2 | 1 |
| Drawing 7, Drafting | 2 | 35 | ..... | ..... | 6 | ..... |
| Mech. Eng. 19, Mechanical Technology | 1 | 47 | ..... | 2 | ..... | 1 |
| Mech. Eng. 3, Shop | 3 | 47 | ..... | 1 | 7 | 1 |
| Option | 2 | ..... | ..... | ..... | ..... | ..... |
| Military Drill | 1 | 50 | ..... | ..... | 3 | ..... |

### *Second Semester*

| | | | | | | |
|---|---|---|---|---|---|---|
| Eng. Math. 74, Integral Calculus | 5 | 45 | 5 | ..... | ..... | 10 |
| Physics 8, General Physics | 4 | 52 | 3 | 1 | ..... | 8 |
| Physics 10, General Lab. Practice | 1 | 52 | ..... | ..... | 3 | ..... |
| Drawing 8, Drafting | 2 | 35 | ..... | ..... | 6 | ..... |
| Chemistry 38, Power Plant Chemistry | 3 | 30 | 1 | 1 | 4 | 3 |
| Mech. Eng. 6, Shop | 2 | 47 | ..... | 1 | 4 | 1 |
| Option | 2 | ..... | ..... | ..... | ..... | ..... |
| Military Drill | 1 | 50 | ..... | ..... | 3 | ..... |
| Mech. Eng. 5, Summer Shop | 4 | 47 | ..... | ..... | 44* | ..... |
| Summer Reading (Optional) | 1 | ..... | ..... | ..... | 3 | ..... |

## JUNIOR YEAR

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Eng. Math. 75, Tech. Mechanics, Statics | 3 | 45 | 3 | ..... | ..... | 6 |
| Eng. Math. 151, Mechanics of Materials | 3 | 45 | 3 | ..... | ..... | 6 |
| Exp. Eng. 101, Materials | 2 | 42 | ..... | ..... | 4 | 2 |
| Mech. Eng. 15, Mechanism and Kinematics | 4 | 47 | 3 | ..... | 4 | 5 |
| Economics 11, Problems for Engineers | 3 | 36 | 3 | ..... | ..... | 6 |
| Option | 3 | ..... | ..... | ..... | ..... | ..... |

### *Second Semester*

| | | | | | | |
|---|---|---|---|---|---|---|
| Eng. Math. 76, Tech. Mechanics, Dynamics | 3 | 45 | 3 | ..... | ..... | 6 |
| Eng. Math. 152, Hydraulics | 3 | 45 | 3 | ..... | ..... | 6 |
| Exp. Eng. 102, Hydraulic and Steam Lab. | 2 | 42 | ..... | ..... | 4 | 2 |
| Mech. Eng. 116, Machine Design | 4 | 48 | 1 | 1 | 8 | 2 |
| Economics 12, Problems for Engineers | 3 | 36 | 3 | ..... | ..... | 6 |
| Option | 3 | ..... | ..... | ..... | ..... | ..... |

## SENIOR YEAR

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 129, Stm. Engines and Boilers | 3 | 49 | 3 | ..... | ..... | 6 |
| Exp. Eng. 103, Steam and Power Lab. | 2 | 42 | ..... | ..... | 4 | 2 |
| Elect. Eng. 157, Electric Power, D. C. | 3 | 39 | 2 | ..... | 3 | 4 |
| Mech. Eng. 117, Machine Design | 2 | 48 | ..... | ..... | 6 | ..... |
| Metallurgy 159, Metallography | 2 | 50 | 1 | 1 | 3 | 1 |
| Political Science 25, Am. Gov't. | 3 | 52 | ..... | ..... | ..... | 6 |
| Approved Electives | 3 | ..... | ..... | ..... | ..... | ..... |

*The Summer Course in Shop is held during the vacation period following the sophomore year, and is in session for four weeks.

### *Second Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 124, Int. Combustion Eng. | 3 | 48 | 3 | ..... | ..... | 6 |
| Exp. Eng. 104, Power and Gas Eng. Lab. | 2 | 42 | ..... | ..... | 4 | 2 |
| Elect. Eng. 158, Electric Power, A. C. | 3 | 40 | 2 | ..... | 3 | 4 |
| Mech. Eng. 132, Meas. of Power | 2 | 49 | 2 | ..... | ..... | 4 |
| Civil Eng. 50, Elements of Structures | 3 | 32 | ..... | ..... | ..... | ..... |
| Political Science 26, Business Law | 2 | 52 | 2 | ..... | ..... | 4 |
| Approved Electives | 3 | ..... | ..... | ..... | ..... | ..... |

## SENIOR YEAR, 1916-17

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 116, Machine Design | 4 | 48 | 1 | 1 | 8 | 2 |
| Political Science 25, Am. Govt. | 3 | 52 | 3 | ..... | ..... | 6 |
| Elect. Eng. 157, Electric Power | 3 | 39 | 2 | ..... | 3 | 4 |
| Exp. Eng. 103, Steam and Power Lab. | 3 | 42 | ..... | ..... | 6 | 3 |
| Metallurgy 159, Metallography | 2 | 50 | 1 | 1 | 3 | 1 |
| Approved Elective | 3 | ..... | ..... | ..... | ..... | ..... |

### *Second Semester*

| | | | | | | |
|---|---|---|---|---|---|---|
| Mech. Eng. 117, Machine Design | 2 | 48 | ..... | ..... | 6 | ..... |
| Political Science 26, Business Law | 3 | 52 | 3 | ..... | ..... | 6 |
| Mec. Eng. 132, Meas. of Power | 3 | 49 | 2 | ..... | 3 | 4 |
| Elect. Eng. 158, Electric Power | 3 | 40 | 2 | ..... | 3 | 4 |
| Exp. Eng. 104, Power and Gas Eng. Lab. | 3 | 42 | ..... | ..... | 6 | 3 |
| Approved Electives | 4 | ..... | ..... | ..... | ..... | ..... |

## POST-SENIOR YEAR, 1916-17

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Eng. Math. 153, Thermodynamics | 3 | 45 | 3 | ..... | ..... | 6 |
| Mech. Eng. 131, Steam Engines and Boilers | 2 | 49 | 2 | ..... | 3 | 4 |
| Mech. Eng. 121 or 123, Engine Design | 3 | 48 | ..... | ..... | 8 | 1 |
| or | | | | | | |
| Mech. Eng. 141, Railway Design | 3 | 49 | ..... | ..... | 8 | 1 |
| Mech. Eng. 133, Heating and Vent. | 2 | 49 | 1 | ..... | 3 | 2 |
| or | | | | | | |
| Mech. Eng. 139, Railway Technology | 2 | 49 | 1 | ..... | 3 | 2 |
| Exp. Eng. 127, Steam and Power Lab. | 3 | 43 | ..... | ..... | 6 | 3 |
| Approved Electives | 4–5 | ..... | ..... | ..... | ..... | ..... |
| Thesis | ..... | ..... | ..... | ..... | ..... | ..... |

### *Second Semester*

| | | | | | | |
|---|---|---|---|---|---|---|
| Eng. Math. 154, Turbines | 3 | 45 | 3 | ..... | ..... | 6 |
| or | | | | | | |
| Economics, Elective | 3 | ..... | 3 | ..... | ..... | 6 |
| Mech. Eng. 138, Contracts and Spec. | 1 | 49 | ..... | 1 | ..... | 2 |
| Mech. Eng. 126, Adv. Machine Design | 4 | 48 | ..... | ..... | 8 | 1 |
| or | | | | | | |
| Mech. Eng. 142, Railway Design | 3 | 49 | ..... | ..... | 8 | 1 |
| Exp. Eng. 128, Gas Engines | 3 | 43 | ..... | ..... | 6 | 3 |
| Thesis | 3 | ..... | ..... | ..... | ..... | ..... |
| Approved Electives | 5–7 | ..... | ..... | ..... | ..... | ..... |

## POST-SENIOR YEAR

### *First Semester*

| Required of all | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 111, Industrial Management | 2 | 47 | 1 | 1 | ..... | 4 |
| Mech. Eng. 115, Power Engineering | 3 | 48 | 2 | ..... | 4 | 3 |
| Mech. Eng. 133, Heating and Ventilating | 2 | 49 | ..... | ..... | ..... | ..... |
| Exp. Eng. Engineering Laboratory | 3 | ..... | ..... | ..... | 6 | 3 |
| Eng. Math. 153, Thermodynamics | 3 | 45 | 3 | ..... | ..... | 6 |
| Approved Elective | 0–3 | ..... | ..... | ..... | ..... | ..... |
| Options | 3–5 | ..... | ..... | ..... | ..... | ..... |

### *Second Semester*

| | | | | | | |
|---|---|---|---|---|---|---|
| Mech. Eng. 138, Contracts and Specif. | 1 | 49 | 1 | ..... | ..... | 2 |
| Exp. Eng., Engineering Lab. or equivalent | 3 | ..... | ..... | ..... | ..... | ..... |
| Civil Eng. 162, Reinforced Concrete | 2 | 34 | 2 | ..... | ..... | 4 |
| Eng. Math. 154, Turbines | 3 | 45 | 3 | ..... | ..... | 6 |
| Thesis | 3 | ..... | ..... | ..... | 9 | ..... |
| Approved Elective | 0–3 | ..... | ..... | ..... | ..... | ..... |
| Options | 3–5 | ..... | ..... | ..... | ..... | ..... |

Options must be selected from one of the following groups at the beginning of the fifth year.

Electives may be selected from any optional group, or an approved free elective may be chosen.

Total credits not less than 18 nor more than 20.

## POST-SENIOR OPTIONS IN RAILWAY MECHANICAL ENGINEERING

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 139, Railway Technology | 2 | 49 | ..... | ..... | ..... | ..... |
| Mech. Eng. 141, Railway Design | 3 | 49 | ..... | ..... | 8 | 1 |
| Mech. Eng. 143, Locomotive Construction. | 1 | 49 | 1 | ..... | ..... | 2 |
| Elect. Eng. 113, Electric Railways | 2 | 39 | ..... | ..... | ..... | ..... |
| Civil Eng. 113, Railway Engineering | 3 | 32 | ..... | ..... | ..... | ..... |
| Economics 73, Railway Problems | 3 | 37 | 3 | ..... | ..... | 6 |

### *Second Semester*

| | | | | | | |
|---|---|---|---|---|---|---|
| Mech. Eng. 142, Railway Design | 3 | 49 | ..... | ..... | 8 | 1 |
| Mech. Eng. 144, Locomotive Construction | 1 | 50 | 1 | ..... | ..... | 2 |
| Mech. Eng. 145, Locomotive Road Testing | 3 | 50 | ..... | ..... | ..... | ..... |
| Elect. Eng. 228, Stm. Ry. Electrification | 2 | 41 | ..... | ..... | ..... | ..... |
| Economics 74, Railway Problems | 3 | ..... | 3 | ..... | ..... | 6 |
| Metallurgy 162, Adv. Metallography | 3 | 50 | 1 | 1 | 6 | 1 |

## POST-SENIOR OPTIONS IN INDUSTRIAL ENGINEERING

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 7a, Industrial Managem't Lab. | 2 | 47 | ..... | ..... | 4 | 2 |
| Mech. Eng. 125, Tool Design | 2 | 48 | ..... | ..... | 6 | 3 |
| Civil Eng. 175, Industrial Sanitation | 2 | 34 | ..... | 2 | ..... | 4 |
| Economics 34, Business Organization | 3 | 36 | 1 | 2 | ..... | 6 |
| Economics 35, Accounting | 3 | 36 | ..... | ..... | ..... | ..... |

### *Second Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 7b, Industrial Managem't Lab. | 2 | 47 | ..... | | 4 | 2 |
| Mech. Eng. 125, Tool Design..... | 2 | 48 | ..... | | 6 | 3 |
| Mech. Eng. 140, Safety Engineering..... | 2 | 49 | ..... | 2 | ..... | 2 |
| Elect. Eng. 234, Val. Electric Properties .. | 1 | 41 | ..... | 1 | ..... | |
| Economics 161, or 165 Labor Problems.... | 3 | 37 | ..... | | ..... | |

## POST-SENIOR OPTIONS IN POWER ENGINEERING

### *First Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 121, Steam Engine Design.... | 3 | 48 | ..... | | 8 | 1 |
| Mech. Eng. 123, Gas Engine Design..... | 3 | 48 | ..... | | 8 | 1 |
| Mech. Eng. 113, Power Plant Operation... | 1 or 2 | 48 | ..... | | 3 or 6 | ..... |
| Civil Eng. 121, Hydrology..... | 3 | 33 | ..... | | ..... | |

### *Second Semester*

| | Credits | Page | Rec. | Lect. | Lab. | Prep. |
|---|---|---|---|---|---|---|
| Mech. Eng. 119, Autos and Gas Tractors . | 3 | 48 | ..... | 2 | 2 | 2 |
| Mech. Eng. 127, Power Plant Design..... | 3 | 48 | 1 | 1 | 6 | 1 |
| Mech. Eng. 113, Power Plant Operation... | 1 or 2 | 48 | ..... | | 3 or 6 | ..... |
| Mech. Eng. 136, Comp. Air. and Refrig... | 3 | 49 | 3 | ..... | | 6 |
| Mech. Eng. 147, Mech. Equip. of Bldgs... | 3 | 50 | ..... | 1 | 6 | 1 |
| Civil Eng. 122, Water Power..... | 3 | 33 | ..... | | ..... | |

## GENERAL OPTIONS

### *First Semester*

| | |
|---|---|
| Psychology | 2 |
| Logic | 2 |
| Public Speaking | 3 |
| Technical Writing | 2 |
| English | 3 |
| French | 3 |
| German | 3 |
| Spanish | 3 |
| Political Science (Govt.) | 2 |
| Economics 73* | 3 |
| Economics 161* | 3 |

### *Second Semester*

| | |
|---|---|
| Logic | 2 |
| Psychology | 2 |
| Public Speaking | 3 |
| Technical Writing | 2 |
| English | 3 |
| French | 3 |
| German | 3 |
| Spanish | 3 |
| Political Science (Bus. Law) | 2 |
| Economics 74* | 3 |
| Economics 166* | 3 |

*Must be preceded by 11 and 12.

Students who did not have two years of German or French in high school are urged to begin a foreign language in the junior year.

## ELECTRICAL ENGINEERING

For freshman year, see page 13

### SOPHOMORE YEAR

*First Semester*

Engineering Mathematics 73a, Differential Calculus, 5
Physics 7, General Physics, 4
Physics 9, General Laboratory Practice, 1
Drawing 7, Drafting, 2
Mechanical Engineering 3a, Shop, 3
Electrical Engineering 51, Applied Electricity, 3
Military Drill, 1

*Second Semester*

Engineering Mathematics 74, Integral Calculus, 5
Physics 8, General Physics, 4
Physics 10, General Laboratory Practice, 1
Drawing 8, Drafting, 2
Electrical Engineering 52, Applied Electricity, 3
Mechanical Engineering 4b, Shop, 3
Military Drill, 1

### JUNIOR YEAR

*First Semester*

Engineering Mathematics 75, Technical Mechanics, Statics, 3
Engineering Mathematics 151, Mechanics of Materials, 3
Experimental Engineering 101, Materials Testing Laboratory, 2
Electrical Engineering 101, Electrical Machinery, 3
Electrical Engineering 103, Electrical Laboratory, 2
Physics 162a, Electrical Measurements, 2
Approved Elective, 3

*Second Semester*

Engineering Mathematics 76, Technical Mechanics, Dynamics, 3
Engineering Mathematics 152, Hydraulics, 3
Experimental Engineering 102, Hydraulic and Steam Laboratory, 2
Electrical Engineering 102, Electrical Machinery, 3
Electrical Engineering 104, Electrical Laboratory, 2
Mechanical Engineering 16, Mechanism and Kinematics, 2
Approved Elective, 3

### SENIOR YEAR

*First Semester*

Electrical Engineering 105, Alternating Currents, 3
Electrical Engineering 117, Electrical Design, 2
Electrical Engineering 107, Electrical Laboratory, 2

Mechanical Engineering 129, Steam Engine and Boilers, 3
Experimental Engineering 105, Steam and Power Laboratory, 2
Economics 11, Modern Economic Problems for Engineers, 3
Approved Elective, 3

*Second Semester*

Electrical Engineering 106, Alternating Currents, 3
Electrical Engineering 118, Electrical Design, 2
Electrical Engineering 108, Electrical Laboratory, 2
Mechanical Engineering 116, Machine Design, 4
Economics 12, Modern Economic Problems for Engineers, 3
Approved Elective, 4

POST-SENIOR YEAR

*First Semester*

Electrical Engineering 213, Transient Electric Phenomena, 2
Electrical Engineering 205, Central Stations, 2
Electrical Engineering 229, Advanced Electrical Laboratory, 2
Electrical Engineering 203, Thesis, 3
Electives, 9

*Second Semester*

Electrical Engineering 214, Transient Electric Phenomena, 2
Electrical Engineering 206, Electrical Transmission, 2
Electrical Engineering 230, Laboratory Special Problems, 2
Electrical Engineering 204, Thesis, 3
Electives, 9

ELECTIVES

Suggested for juniors: American Government
English
Foreign Language
Psychology (first semester)
Logic (second semester)
Public Speaking
Technical Writing

Students who did not have two years of German or French in high school are urged to begin a foreign language in the junior year.

Suggested for seniors: Business Law,
Electric Lighting
Journal Reading
Mathematics
Power Plant Operation
Psychology
Public Speaking
Railway Electrical Engineering
Surveying

Suggested for post-seniors: Batteries and Electric Vehicles
Illuminating Engineering
Precise Measurements
Radio-Signaling
Steam Railroad Electrification
Telegraphy and Telephony
Valuation

Students desiring to specialize in Electrochemistry may be permitted to make certain substitutions in the senior and post-senior years if approved by the Faculty.

## GENERAL COURSE IN ENGINEERING

For freshman year, see page 13

### SOPHOMORE YEAR*

*First Semester*

Engineering Mathematics 73a, Differential Calculus, 5
Physics 7, General Physics, 4
Physics 9, General Laboratory Practice, 1
Drawing 5 or 7, 2
Approved Technical Elective, 3
Approved Elective, 3
Military Drill, 1

*Second Semester*

Engineering Mathematics 74, 5
Physics 8, General Physics, 4
Physics 10, General Laboratory Practice, 1
Drawing 6 or 8, 2
Approved Technical Elective, 3
Approved Elective, 3
Military Drill, 1

### JUNIOR YEAR

*First Semester*

Engineering Mathematics 75, Technical Mechanics, Statics, 3
Engineering Mathematics 151, Mechanics of Materials, 3
Experimental Engineering 101, Materials Testing Laboratory, 2
Approved Technical Electives, 5
Approved Electives, 5

*Second Semester*

Engineering Mathematics 76, Technical Mechanics, Dynamics, 3
Engineering Mathematics 152, Hydraulics, 3
Experimental Engineering 102, Hydraulic and Steam Laboratory, 2
Approved Technical Electives, 5
Approved Electives, 5

*Students pursuing the course in General Engineering are required at the end of the sophomore year to submit to the Dean of the College a list of proposed electives for the junior and senior years.

SENIOR YEAR

*Each Semester*

Approved Technical Electives, 9
Approved Electives, 9

## ARCHITECTURE

FRESHMAN YEAR

*First Semester*

Mathematics 71a, Algebra and Trigonometry, 5
Drawing 9, Graphics, 2
Rhetoric 3, Rhetoric and Composition, 3
French 1, 3
Architecture 21, Freehand Drawing, 2
Architecture 31, Elements of Architecture, 3
Military Drill, 1

*Second Semester*

Mathematics 72, Analytical Geometry, 5
Drawing 10, Graphics, 2
Rhetoric 4, Rhetoric and Composition, 3
French 2, 3
Architecture 22, Freehand Drawing, 2
Architecture 32, Elements of Architecture, 3
Military Drill, 1

All students pursuing the above courses register for Mathematics 71a in the first semester. At the end of two weeks trial those who by reason of inadequate preparation or undeveloped mathematical insight are judged unable to carry the work successfully, are re-registered in Engineering Mathematics 69-70, in which the intensive work of Mathematics 71a is expanded into a course covering the full year. The resulting deficiency in Mathematics 72 must be made up in the Summer School.

SOPHOMORE YEAR

*First Semester*

Mathematics and Mechanics 91, Mechanics, 4
Physics 1, General Physics, 3
Physics 3, General Laboratory Practice, 1,
Architecture 23, Freehand Drawing, 2
Architecture 33, Elementary Design, 4
Architecture 43, Specifications and Working Drawings, 3
Military Drill, 1

*Second Semester*

Mathematics and Mechanics 92, Strength of Materials, 4
Physics 2, General Physics, 3

Physics 4, General Laboratory Practice, 1
Architecture 24, Freehand Drawing, 2
Architecture 34, Elementary Design, 4
Architecture 44, Specifications and Working Drawings, 3
Military Drill, 1

JUNIOR YEAR

*First Semester*

Architecture 15, Architectural History, Ancient, 2
Architecture 25, Freehand Drawing, 3
Architecture 35, Architectural Design, 6
Architecture 65, Theory of Architecture, 1
Civil Engineering 41, Elements of Structures, 3
Approved Electives, 3

*Second Semester*

Architecture 16, Architectural History, Renaissance, 2
Architecture 26, Freehand Drawing, 3
Architecture 36, Architectural Design, 6
Architecture 66, Theory of Architecture, 1
Civil Engineering 42, Reinforced Concrete, 3
Approved Electives, 3

SENIOR YEAR

*First Semester*

Architecture 17, Architectural History, Medieval, 2
Architecture 27, Life Drawing, 2
Architecture 57, Decorative Composition, 2
Architecture 37, Architectural Design, 8
Architecture 67, History of Sculpture and Painting, 2
Civil Engineering 21, Building Sanitation, 2

*Second Semester*

Architecture 18, Architectural History, Modern, 2
Architecture 28, Life Drawing, 2
Architecture 58, Decorative Composition, 2
Architecture 38, Architectural Design, 8
Architectural Practice, 2
Mechanical Engineering 134, Heating and Ventilating, 2

POST-SENIOR YEAR

Work divided into major and minor groups all elective.

Required number of credit hours 18 or 19.

All students required to take one major and at least two minor groups, but may take three minors.

Credit hour value of major group 10, or minor group 4 or 3, making total credit hour program 10, 4, 4; or 10, 3, 3, 3.

Major groups: (a) Architectural Design
(b) Architectural Construction

Minor groups: (a) Painting, Modeling, Figure Composition, Decorative Design
(b) Liberal Studies
(c) Engineering or Technical Studies
Structures
Materials Laboratory
Heating and Ventilation
Mechanical Equipment of Buildings
Electrical Equipment of Buildings
(d) Architectural History research

# DEPARTMENTAL STATEMENTS*

## ARCHITECTURE

Professor FREDERICK M. MANN; Assistant Professor ROY C. JONES; Instructors SAMUEL C. BURTON, JAMES H. FORSYTHE; Special Lecturer JOHN O. CEDERBERG.

### COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 15. | Architectural History | 2 | Jr. Arch. | 31, 32 |
| 16. | Architectural History | 2 | Jr. Arch. | 31, 32 |
| 17. | Architectural History | 2 | Sr. Arch. | 15 |
| 18. | Architectural History | 2 | Sr. Arch. | 16 |
| 21. | Elementary Freehand Drawing | 2 | Fr. Arch. | .. |
| 22. | Elementary Freehand Drawing | 2 | Fr. Arch. | 21 |
| 23. | Freehand Drawing | 2 | Soph. Arch. | 22 |
| 24. | Freehand Drawing | 2 | Soph. Arch. | 23 |
| 25. | Freehand Drawing | 3 | Jr. Arch. | 24 |
| 26. | Freehand Drawing | 3 | Jr. Arch. | 25 |
| 27. | Life Drawing | 2 | Sr. Arch. | 26 |
| 28. | Life Drawing | 2 | Sr. Arch. | 27 |
| 31. | Elements of Architecture | 3 | Fr. Arch. | .. |
| 32. | Elements of Architecture | 3 | Fr. Arch. | 31 |
| 33. | Architectural Design, Elementary | 4 | Soph. Arch. | 32 |
| 34. | Architectural Design, Elementary | 4 | Soph. Arch. | 33 |
| 35. | Architectural Design, Intermediate | 6 | Jr. Arch. | 34 |
| 36. | Architectural Design, Intermediate | 6 | Jr. Arch. | 35 |
| 37. | Architectural Design, Advanced | 8 | Sr. Arch. | 36 |
| 38. | Architectural Design, Advanced | 8 | Sr. Arch. | 37 |
| 43. | Specifications and Working Drawings | 3 | Soph. Arch. | 31, 32 |
| 44. | Specifications and Working Drawings | 3 | Soph. Arch. | 43 |
| 57. | Decorative Composition | 2 | Sr. Arch. | 36 |
| 58. | Decorative Composition | 2 | Sr. Arch. | 26, 36 |
| 65. | Theory of Architecture | 1 | Jr. Arch. | 34 |
| 66. | Theory of Architecture | 1 | Jr. Arch. | 65 |
| 67. | History of Sculpture and Painting | 2 | Jr. Arch. | 15, 16 |
| 68. | Architectural Practice | 2 | Sr. Arch. | Senior Standing |

15. ARCHITECTURAL HISTORY. Technical study of the architecture of Egypt, Assyria, Persia, Greece and Rome, especially the latter two. Lectures and library research. MANN.

16. ARCHITECTURAL HISTORY. Development of the Renaissance movement in the Fine Arts. Technical study of architecture in Italy, particularly in the fifteenth, sixteenth, and seventeenth centuries. Lectures and library research. FORSYTHE.

*In the statements of the curriculum which follow, the scheme numbering of the courses indicates the semester in which it is given. First semester courses have odd numbers, second semester courses even numbers. A figure following a specific subject indicates the number of credit hours of work required.

17. ARCHITECTURAL HISTORY. Technical study of architecture during the Middle Ages; the sources and influences in the development of the Romanesque and Gothic styles. Lectures and library research. MANN.

18. ARCHITECTURAL HISTORY. Study of the development of architecture from the seventeenth century to the present time, particularly in France, England and America. Spirit of Modern and Early Renaissance architecture contrasted. Lectures and library research. MANN.

21. ELEMENTARY FREEHAND DRAWING. Drawing from casts and from memory. Details of the figure and architectural ornament in charcoal, pencil and pen and ink. BURTON.

22. ELEMENTARY FREEHAND DRAWING. Continuation of Course 21, with the addition of studies executed in monochrome. BURTON.

23. FREEHAND DRAWING. Drawing from head life; advanced figure work from casts and from architectural compositions, in color, pen and ink, charcoal and pencil. BURTON.

24. FREEHAND DRAWING. Painting from the head and still life; advanced figure work from casts and from decorative compositions in color, pen and ink, charcoal and pencil. BURTON.

25. FREEHAND DRAWING. Continuation of Course 24, with introduction of working drawings for figure compositions, executed in color, charcoal and chalks. BURTON.

26. FREEHAND DRAWING. Same as Course 25, with the addition of landscape painting. BURTON.

27. LIFE DRAWING. Drawing from life. Given at the Minneapolis Art Institute.

28. LIFE DRAWING. Continuation of Course 27.

31. ELEMENTS OF ARCHITECTURE. Lectures on elements of architecture. Exercises in instrumental drawing and wash rendering; architectural lettering; study of walls, doors, windows, mouldings. FORSYTHE.

32. ELEMENTS OF ARCHITECTURE. Lectures on elements of architecture. Study of the classic orders by means of simple problems in design, and composition of architectural fragments, rendered in wash.

33. ARCHITECTURAL DESIGN. Rendered order problems and sketch problems involving elementary principles of composition. Library research in the elements of composition. JONES.

34. ARCHITECTURAL DESIGN. Order problems, sketch problems, simple elements of plan. Library research in elements of composition. JONES.

35. ARCHITECTURAL DESIGN. Original problems of intermediate grade in composition of plan, exterior and section. Rendered and sketch problems and library research. JONES.

36. ARCHITECTURAL DESIGN. Continuation of above.*

37. ARCHITECTURAL DESIGN. Original problems of advanced grade. Rendered and sketch problems. JONES.

38. ARCHITECTURAL DESIGN. Continuation of the above. JONES.

43. SPECIFICATIONS AND WORKING DRAWINGS. Wood in construction; properties. Preparing plans and detail working drawings of a frame house. Written reports on a building under construction, with measured drawings of roofs, dormers, cornice, windows, stairs, fireplace, cupboards, etc. CEDERBERG.

44. SPECIFICATIONS AND WORKING DRAWINGS. Masonry construction. Materials, their manufacture and properties. Preparing plans and detail working drawings of simple fire-proof buildings. Reports from buildings under construction, with measured drawings of important details. Specifications. CEDERBERG.

57. DECORATIVE COMPOSITION. Theories of color, and the application of color to architectural decoration. Interior detail and decoration. MANN.

58. DECORATIVE COMPOSITION. The design of relief decoration. Drawing, and clay modeling. BURTON.

65. THEORY OF ARCHITECTURE. A study of the guiding principles of architectural expression. Program analysis. JONES.

66. THEORY OF ARCHITECTURE. Continuation of the above. JONES.

67. HISTORY OF SCULPTURE AND PAINTING. Historical study of ancient and modern sculpture and of the modern schools of painting. BURTON.

68. ARCHITECTURAL PRACTICE. Relations of the architect, owner and builder; forms of contracts, professional ethics and office administration. MANN.

## CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Associate Professor EVERHART P. HARDING; Instructor FRANK W. BLISS.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 23. | General Chem. and Qual. Analysis | 5 | Fr. | None |
| 25. | Chemistry for Engineers..... | 3 | Fr. | One yr. prep. Gen. Chem. |
| 26. | Chemistry for Engineers..... | 3 | Fr. | 23 or 25 |
| 38. | Power Plant Chemistry..... | 3 | Soph., M. E. | 26 |
| 109. | Water Analysis..... | 3 | Elective p. sr. C. E. | 26 |

*By special arrangement in coöperation with the Minnesota Chapter of the American Institute of Architects, each junior architect, who has had less than two years of practical office experience, will be assigned to practical work in an architect's office either in Minneapolis or St. Paul. This work will extend over not less than eighteen hours of each week during either the first or second semester and will take the place of one of the junior design courses, either Architecture 35, or Architecture 36, and will carry six semester credit hours.

23. General Chemistry and Qualitative Analysis. Designed for those who have had no high school chemistry, in preparation for Course 26. See statement under 25. Frankforter, Bliss, and Assistants.

25. Chemistry for Engineers. An advanced course for engineers; general chemistry, with an introduction to analytical chemistry and chemical theories. Frankforter, Bliss, and Assistants.

26. Chemistry for Engineers. A continuation of Course 25. Frankforter, Bliss, and Assistants.

38. Power Plant Chemistry. Methods of sampling and analyzing the most important gases, liquid fuels, and coals; and methods for determining their calorific value for purposes of control work and for learning their heat efficiencies. Lectures and laboratory work. Harding and Assistants.

109. Water Analysis. This course includes an exhaustive discussion of the chemical and sanitary properties of water. Frankforter and Assistants.

## CIVIL ENGINEERING

Professors Francis C. Shenehon, Frederic H. Bass; Associate Professors Adolph F. Meyer, John I. Parcel; Assistant Professors Alvin S. Cutler, Franklin R. McMillan, Otto S. Zelner; Instructor George A. Maney.

### COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 1. | Surveying | 3 | Soph. C. E. | Math. 71a |
| 2. | Surveying | 3 | Soph. C. E. | 1 |
| 3. | Surveying | 2 | Jr. C. E. | 2 |
| 4. | Surveying | 2 | Jr. C. E. | 3 |
| 6. | Summer Camp | 6 | Jr. C. E. | 4 |
| 10. | Surveying | 1 | Elective p. sr. E. E. & M. E. | |
| 21. | Building Sanitation | 2 | Sr. Arch. | .. |
| 41. | Elements of Structures | 3 | Jr. Arch. | M. & M. 92 |
| 42. | Reinforced Concrete | 3 | Jr. Arch. | M. & M. 92 |
| 50. | Elements of Structures | 3 | Sr. M. E. | M. & M. 75 |
| 51. | Stresses in Structures | 3 | Jr. C. E. | M. & M. 75 |
| 52. | Elementary Structural Design | 2 | Jr. C. E. | C. E. 51 |
| 91. | Highways and Pavements | 2 | Jr. C. E. | 3 |
| 92. | Municipal Engineering | 3 | Jr. C. E. | 91 |
| 103. | Water Supply | 3 | Sr. C. E. | 92 |
| 104. | Sanitary Engineering | 3 | Sr. C. E. | 92 |
| 107–8. | Geodesy | 3 | Elective | 4, 6 |
| 111. | Railway Engineering | 3 | Sr. C. E. | 3 |
| 112. | Railway Engineering | 3 | Elective sr. C. E. | 111 |
| 113. | Railway Engineering | 3 | Elective p. sr. C. E. & M. E. | |
| 114. | Railway Engineering | 3 | Elective p. sr. C. E. | .. |
| 121. | Hydrology | 3 | Sr. C. E. | M. & M. 152 |
| 122. | Water Power | 3 | Sr. C. E. | 121 |

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 123. | Hydraulic Design | 3 | Elective p. sr. C. E. | 122 |
| 124. | Hydraulic Design | 3 | Elective p. sr. | 123 |
| 126. | Hydrology and Water Power | 3 | Elective | M. & M. 152 |
| 132. | Rivers, Harbors, and Canals | 3 | Elective p. sr. | .. |
| 151. | Bridge Analysis | 3 | Sr. C. E. | C. E. 52 |
| 152. | Bridge Design | 3 | Sr. C. E. | C. E. 151 |
| 155. | Structural Design | 3 | Elective p. sr. | p. sr. standing |
| 156. | Structural Design | 3 | Elective p. sr. | p. sr. standing |
| 157. | Reinforced Concrete | 3 | Sr. C. E. | 51-52 |
| 158. | Reinforced Concrete Design | 3 | Elective sr. C. E. | 157 |
| 159. | Advanced Theory of Structures | 3 | Elective p. sr. | p. sr. standing |
| 160. | Advanced Theory of Structures | 4 | Elective p. sr. | p. sr. standing |
| 162. | Reinforced Concrete | 2 | Elective sr. M. E. & E. E. | .. |
| 171. | City Planning | 3 | Elective p. sr. | .. |
| 173. | Building Sanitation | 3 | Elective p. sr. | .. |
| 174. | Sanitary Design | 3 | Elective p. sr. | .. |
| 175. | Industrial Sanitation | 2 | Elective p. sr. M. E. & E. E. | .. |
| 201–2. | Theory of Indeterminate Structures | 4 | Graduate (One or two semesters) | |
| 203–4. | Reinforced Concrete Analysis | 2 or 3 | Graduate and Elective | 157 or equivalent |

1. SURVEYING. Field problems; use of chain, compass, transit and level. Computation and platting of all surveys made in the field. Determination of area—D.M.D.; and methods of platting. Surveys of the U.S. public lands. CUTLER, ZELNER.

2. SURVEYING. Lectures, drawing room and field work, including a study of topographic maps and signs; principles of the stadia, barometers; leveling, platting of profiles and grades. CUTLER, ZELNER.

3. SURVEYING. A complete topographical survey, stadia method, is made and platted. CUTLER, ZELNER.

4. SURVEYING. Elements of hydrographic, municipal, and railroad surveying. Use of current meters, plane table, sextant, theodolite. Meridian by solar observations. Computing and staking railroad curves. Preparatory to the more advanced work carried on in Summer Camp. CUTLER, ZELNER.

6. SUMMER CAMP. Five weeks. Continuation of Course 4, including extended railroad, topographic, hydrographic, and triangulation surveys. CUTLER, ZELNER.

10. SURVEYING. A short course in the use, care, and adjustment of surveying instruments. (Open to post-seniors only.) ZELNER.

21. BUILDING SANITATION. The location and orientation of buildings; lighting, ventilation, water supply, plumbing, sewage, and refuse disposal. BASS.

41. ELEMENTS OF STRUCTURES. Theory and design of beams, columns, roof trusses, plate girders. PARCEL.

42. Reinforced Concrete. Elementary principles and designing methods. Parcel.

50. Elements of Structures. A brief course for Mechanical and Electrical Engineers. Laws of equilibrium applied to structural frames; design of roof truss and plate girder. Maney.

51. Stresses in Structures. The fundamental principles of structural mechanics, and their applications to beams and girders, simple trusses, the framed bent, etc. Parcel.

52. Elementary Structural Design. Proportioning of tension and compression members, riveted joints. Design of mill and office buildings. Parcel.

91. Highways and Pavements. Lectures, recitations, laboratory work, and field inspection, relating to the economics, location, construction, and maintenance of highways and pavements. Bass.

92. Municipal Engineering. Development of municipal public works. City planning, transportation, and housing. The principles of public health and sanitation. Public water supplies, sewerage and sewage disposal, refuse collection and disposal, the sanitation of buildings. Bass.

103. Water Supply Engineering. Sources of water supply; quality of water. Laboratory methods of testing water; wells, surface water intakes, conduits and pipe lines, distribution systems, and purification plants. Selection of pumping machinery and motive power. Bass.

104. Sanitary Engineering. Quantities of sewage and storm water; precipitation and run off. Sanitary sewer system for a small community; storm water system for a city district. Stream pollution and sewage disposal. Bass.

107-8. Geodesy. Methods of conducting a geodetic survey, lectures and assigned readings. Zelner.

111. Railway Engineering. The mathematics of curves and earthwork; their application to location and construction; switches and crossovers; methods of computing earthwork and haul. Completion of maps and profiles of summer camp work, field and office work. Cutler.

112. Railway Engineering. Design and construction of railroad buildings and structures; culverts, wooden trestles, switches, crossovers, crossing frogs. The student is familiarized with the principal structures coming under the supervision of the maintenance-of-way department of a modern railroad. Cutler.

113. 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. CUTLER.

114. RAILWAY ENGINEERING. Lectures, office work, and field inspection. Design and operations of various types of yards and terminals, and terminal facilities, including the hump, engine house, coal and water station. Signalling and interlocking. CUTLER.

121. HYDROLOGY. Rainfall, evaporation, transpiration, percolation, runoff. Flood and low water flows of streams. Storage for use in water supply, water power, irrigation, and navigation. Mass curves and frequency curves. MEYER.

122. WATER POWER. Types of low, medium, and high head developments. Details of developments; spillway dams; hollow reinforced concrete dams, arch dams, high masonry dams, movable dams. Turbine settings and characteristics. MEYER.

123. HYDRAULIC DESIGN. Detailed design of hollow reinforced concrete, arch and high masonry dams. Design of power house from forebay to tailrace for typical developments. Pipe lines, reservoirs, surge tanks. Inspection of plants. MEYER.

124. HYDRAULIC DESIGN. Study of special hydraulic problems in laboratory, drafting room, and field. MEYER.

126. HYDROLOGY AND WATER POWER. A course of lectures, designed primarily for Electrical and Mechanical Engineers, covering the same field as Courses 121 and 122. MEYER.

132. RIVERS, HARBORS, AND CANALS. Applications of Hydraulics and Hydrography to problems of navigable streams and waterways. Precise stream measurement. Characteristics of great bodies of water. Submarine excavation; canal prisms, revetments, ship-locks, docks, breakwaters. Maintenance of regimen. SHENEHON.

151. BRIDGE ANALYSIS. Analysis of various types of railway bridge trusses (including Baltimore and Petit types) under moving loads. MANEY.

152. BRIDGE DESIGN. Complete design and detail of typical railway structure such as plate girder viaduct or riveted truss span. MANEY.

155. STRUCTURAL DESIGN. Complete design and general drawing of railway pin truss span. PARCEL.

156. STRUCTURAL DESIGN. Critical and comparative study of designing principles and methods. Specifications and office methods. PARCEL.

157. REINFORCED CONCRETE. Principles of reinforced concrete. Theory of beams, slabs, and columns, and their application to ordinary structures. Lectures, problems, and design. MCMILLAN.

158. Reinforced Concrete Design. Continuation of Course 157 with special emphasis on the practical features of design of buildings, bridges, retaining walls, etc. Problems in design and lectures. McMillan.

159. Advanced Theory of Structures. Fundamental theory of deflections and indeterminate stresses. Applications to the simpler cases of continuous girders, swing bridges, and redundant members. Parcel, Maney.

160. Advanced Theory of Structures. A continuation of 159. Swing bridges and arches (including the reinforced concrete arch.) Secondary stresses and wind stresses in tall office buildings. Parcel, McMillan, Maney.

162. Reinforced Concrete. A short course embracing the principal features of Course 157.

171. City Planning. The physical elements of the City; topography, drainage, geology. Public works and structures. Street arrangement; rapid transit; railroad terminals. City districting. Sub-surface structures. Esthetic features of the city; the civic center; parks; boulevards; public buildings. Bass, Mann.

173. Building Sanitation. A design course in the sanitation of buildings. Heating and ventilating, plumbing, lighting. Housing problems. Bass, Rowley.

174. Sanitary Design. Continuation of Course C.E. 104. Design of water purification, sewage disposal, and refuse disposal plants. Bass.

175. Industrial Sanitation. Principles of Public Health. Methods in use for prevention of disease. Sanitation and hospital service in factory buildings and grounds. Housing problems. Welfare work. Bass.

201-2. Theory of Indeterminate Structures. Critical and detailed study of selected problems in indeterminate structures. Parcel, Maney.

203-4. Reinforced Concrete Analysis. One or two semesters, two meetings per week. Open to those who have completed 157 or its equivalent. Critical review of the literature of reinforced concrete; study of test data and analysis of stresses in reinforced concrete structures. Two or three credits. McMillan.

## DRAWING AND DESCRIPTIVE GEOMETRY

Professor William H. Kirchner; Assistant Professors Frank B. Rowley, Otto S. Zelner, Instructors Charles H. Blitman, Lyall Decker, Robert W. French.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 1–2. | Engineering Drawing | 3 | Fr. | See statement |
| 3–4. | Descriptive Geometry | 3 | Fr. | See statement |
| 5. | Drafting | 2 | Soph. C. E. | 1–2, 3–4 |
| 6. | Drafting | 2 | Soph. C. E. | 5 |
| 7. | Drafting | 2 | Soph. M. E. & E. E. | 1–2, 3–4 |
| 8. | Drafting | 2 | Soph. M. E. & E. E. | 7 |
| 9. | Graphics | 2 | Fr. Arch. | See statement |
| 10. | Graphics | 2 | Fr. Arch. | See statement |
| 11. | Lettering | 1 | Elective sr. & p. sr. | .. |
| 111–12. | Advanced Descriptive Geometry | 6 | Elective | 5, Math. 74 |
| 113a,b. | Perspective | 3 | Elective | 10, Math. 72 |

1-2. ENGINEERING DRAWING. The elements of drafting. Drawing as a language. Lines, views, sections, dimensions, standards, signs, abbreviations, and explanatory notes. Sketching, lettering, tracing, and blue printing. Details of machines and structures; interpretation of working drawings. ROWLEY, BLITMAN, DECKER, FRENCH, and Assistants.

3. DESCRIPTIVE GEOMETRY. Introductive course in descriptive geometry. Systems of representation, methods, loci, and constructive geometry. Recitations and drawing room exercises. Taken concurrently with Course 1. Open to students in Mathematics 71, or equivalent. KIRCHNER, ROWLEY, ZELNER, DECKER, FRENCH, and Assistants.

4. DESCRIPTIVE GEOMETRY. Central projection and special cases. Representations of lines, planes, and solids, and of their relations; tangencies, intersections, and development. Recitations, lectures, and the solution of problems. Taken concurrently with Course 2. Open to students who have had Solid Geometry. KIRCHNER, BLITMAN, DECKER, and Assistants.

5. DRAFTING. General problems. Application of descriptive geometry. Structural drawing, details, assembly drawings, bills of material. Drafting room methods and systems. FRENCH.

6. DRAFTING. A continuation of Course 5. FRENCH.

7. DRAFTING. Graphics. Working drawings of machinery. Assembly drawings, outline drawings, diagrammatic drawings, layout drawings, and detail drawings. Instruction in drafting room methods and systems. ROWLEY.

8. DRAFTING. A continuation of Course 7. ROWLEY.

9. GRAPHICS. Lectures and exercises in constructive and descriptive geometry with applications. Shades and shadows. Perspective. KIRCHNER.

10. GRAPHICS. A continuation of Course 9. KIRCHNER.

11. LETTERING. A course in freehand lettering for seniors and post-seniors. ZELNER.

111-112. ADVANCED DESCRIPTIVE GEOMETRY. Methods of representation; parallel and central projection. Geometrography, axonometry, and photogrammetry. KIRCHNER.

113a,b. PERSPECTIVE. The principles and practice of perspective, including shadows, reflections, distortions, corrections, systems, methods, the practical problem, and inverse constructions. KIRCHNER.

## ECONOMICS

Professor JOHN H. GRAY; Assistant Professor THOMAS W. MITCHELL; Instructors LLOYD M. CROSGRAVE, ROBERT J. MCFALL.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 3a,b. | Elements of Economics | 3 | Elective | |
| 11. | Modern Economic Problems for Engineers | 3 | Jr. M. E., sr. E. E. | .. |
| 12. | Modern Economic Problems for Engineers | 3 | Jr. M. E., sr. E. E. | 11 |
| 34. | Business Organization | 3 | Elective | 3 |
| 35–36. | Accounting Principles | 6* | Elective | None |
| 73a,b. | Railway Problems | 3 | Elective | 3 credits inc. 3 |
| 131. | Cost Accounting | 3 | Elective | 3, 35–36. |
| 161. | Labor Problems | . | .. | .. |
| 166. | Trade Unionism and Allied Problems. | | | |

*Both semesters must be completed before credit is given for the first semester.

3a,b. ELEMENTS OF ECONOMICS. Elements of economic theory, with special reference to present-day economic and social problems. Marshall, Wright and Field's *Materials* and a textbook, supplemented by lectures. CROSGRAVE, JAMES and Assistants.

11. ECONOMICS. Modern Economic Problems for Engineers. Effect of industrial development; international commerce; corporation organization and finance, banking and credit; public ownership and public finance; trusts and monopolies; transportation problems, insurance, conservation and labor problems. Lectures, textbook assignments, and talks by men actively engaged in the various fields studied. CROSGRAVE.

12. ECONOMICS. Modern Economic Problems for Engineers. Continuation of Course 11.

34. BUSINESS ORGANIZATION. The principles of efficiency in business operation and forms of organization to apply them, the typical departments of a business; their functions, office organization, and administration. Textbook, assigned readings, and lectures. MITCHELL.

35-36. PRINCIPLES OF ACCOUNTING. Purposes of accounts; principles of account classification; capital and revenue; accruals; principles of valuation; depreciation; preparation and interpretation of balance sheets,

income accounts and other business statements; corporation accounts. A laboratory course with supplementary lectures. MITCHELL.

73a,b. RAILWAY PROBLEMS. Methods of railway organization and operation; statistics of operation and finance; economic principles of rate making and of government regulation; railroad discriminations; competition, pooling and combinations. Foreign railways. Lectures, assigned readings, and special topics. MCFALL.

131. COST ACCOUNTING. Elements and classification of production cost; methods of recording materials, labor and machine costs and apportioning indirect expenses; relation of cost to general accounts; use of cost data to enforce efficiency of operation. MITCHELL.

161. LABOR PROBLEMS. Modern labor problems; woman and child labor, industrial education, unemployment, poverty, industrial hygiene, welfare work, profit-sharing, coöperation, labor unions. strikes, boycotts, conciliation, and arbitration; economic causes and effects of immigration. CROSGRAVE.

166. TRADE UNIONISM AND ALLIED PROBLEMS. Development and activities of American trade unions. Economic and legal aspects of collective bargaining, closed shops, strikes, and boycotts. Employer's associations. Conciliation and arbitration. Social significance and probable future of trade unionism. CROSGRAVE.

## ELECTRICAL ENGINEERING

Professors GEORGE D. SHEPARDSON, FRANK W. SPRINGER; Assistant Professor WILLIAM T. RYAN; Instructors ERNEST A. REID, HUBERT M. TURNER.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 51. | Applied Electricity | 3 | Soph. E. E. | Physics 8 |
| 52. | Applied Electricity | 3 | Soph. E. E. | Physics 8 |
| 101. | Electrical Machinery | 3 | Jr. E. E. | Physics 8 |
| 102. | Electrical Machinery | 3 | Jr. E. E. | Physics 8 |
| 103. | Electrical Laboratory | 2 | Jr. E. E. | Physics 8 |
| 104. | Electrical Laboratory | 2 | Jr. E. E. | Physics 8 |
| 105. | Alternating Currents | 3 | Sr. E. E. | 101-104 |
| 106. | Alternating Currents | 3 | Sr. E. E. | 101-104 |
| 107. | Electrical Laboratory | 2 | Sr. E. E. | 101-104 |
| 108. | Electrical Laboratory | 2 | Sr. E. E. | 101-104 |
| 109a,b. | Power Plant Operation | 1 | Elective p. sr. | 101-104 |
| 111. | Electric Lighting | 2 | Elective p. sr. | 102 or 158 |
| 113. | Electric Railways | 2 | Elective p. sr. | 105, 155, or 158 |
| 114. | Electric Railways | 2 | Elective p. sr. | 105, 155, or 158 |
| 115. | Journal Reading | 1 | Elective p. sr. | 105 |
| 116. | Journal Reading | 1 | Elective p. sr. | 105 |
| 117. | Electrical Design | 2 | Sr. E. E. | 105-106 |
| 118. | Electrical Design | 2 | Sr. E. E. | 105-106 |
| 152. | Electric Lighting | 1 | Elective Arch. | Physics 1-4 |
| 156. | Electric Power | 3 | Sr. C. E. | Physics 8 |

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 157. | Electric Power | 3 | Sr. M. E. | Physics 8 |
| 158. | Electric Power | 3 | Sr. M. E. | Physics 8 |
| 203. | Thesis | 3 | P. sr. E. E. | 105-106 |
| 204. | Thesis | 3 | P. sr. E. E. | 105-106 |
| 205. | Central Stations | 2 | Elective p. sr. | 105 or 158 |
| 206. | Electrical Transmission | 2 | Elective p. sr. | 106 or 158 |
| 208. | Batteries and Elec. Vehicles | 1 | Elective p. sr. | 102 or 158 |
| 210. | Elect. Equipment of Bldgs. | 1 | Elective p. sr. | 106 or 158 |
| 213–14. | Transient Electric Phenomena | 2 | Elective p. sr. | 105-106 |
| 215–16. | Radio-Signaling | 2 | Elective p. sr. | 105-106 |
| 219. | Telegraph and Telephone Apparatus | 2 | Elective p. sr. | 106 |
| 220. | Telegraph and Telephone Circuits | 2 | Elective p. sr. | 106 |
| 221. | Precise Elec. Measurements | 1 | Elective p. sr. | 108 |
| 222. | Precise Elect. Measurements | 1 | Elective p. sr. | 108 |
| 223. | Electrochemical Engineering | 2 | Elective p. sr. | 106 or 158 |
| 226. | Illuminating Engineering | 2 | Elective p. sr. | 111 |
| 228. | Steam Railroad Electrification | 2 | Elective p. sr. | 114 |
| 229. | Laboratory Special Problems | 2 | Elective p. sr. | 108 |
| 230. | Laboratory Special Problems | 2 | Elective p. sr. | 108 |
| 232. | Design Special Problems | 2 | Elective p. sr. | 202 |
| 234. | Valuation of Elect. Properties | 1 | Elective p. sr. | 205 |

51. APPLIED ELECTRICITY. Discovery of electrical phenomena. Wire tables, methods and calculation of wiring; National Electrical Code. Laboratory practice in making and insulating joints; names and relation of parts of electrical machinery and instruments; forces and power of dynamo-electric machines. SHEPARDSON, SPRINGER, REID.

52. APPLIED ELECTRICITY. A continuation of Course 51. SHEPARDSON, SPRINGER, REID.

101. ELECTRICAL MACHINERY. Electrical engineering measuring instruments and their use, units, theory of dynamo-electric machinery, methods of regulation, construction and operation of generators and motors, methods of testing. SPRINGER.

102. ELECTRICAL MACHINERY. A continuation of Course 101. SPRINGER.

103. ELECTRICAL LABORATORY. To be taken with Course 101-102. Electrical engineering measurements, calibration of instruments, operation and characteristic curves of generator and motor. Lectures and practice. TURNER, REID.

104. ELECTRICAL LABORATORY. A continuation of Course 103. TURNER, REID.

105. ALTERNATING CURRENTS. Phenomena, measurement, and use of alternating currents, theory of line, transformer, generator and motor, types of apparatus. SHEPARDSON.

106. ALTERNATING CURRENTS. A continuation of Course 105. SHEPARDSON.

107. ELECTRICAL LABORATORY. To be taken with Course 105-106. Experi-

mental study of alternating currents, regulation and efficiency tests of alternators, transformers, motors, and rotaries. SPRINGER, TURNER.

108. ELECTRICAL LABORATORY. A continuation of Course 107. SPRINGER.

109a,b. POWER PLANT OPERATION. Practice in operation and care of gas producer, gas engine, boilers, engines, turbine, dynamos, battery, switch-boards, and auxiliary apparatus of the University Lighting Plant. RYAN, MARTENIS, DIXON.

111. ELECTRIC LIGHTING. Principles of vision, photometers and measurement of light, methods and calculations of illumination, various sources of light, development of electric illuminants, distribution systems. Lectures, problems, and laboratory practice. SHEPARDSON.

113. RAILWAY ELECTRICAL ENGINEERING. History, economics, and application of electric power to railways, principles of mechanics applied to train movement, electric locomotives and motor cars, generation, transmission, and conversion of electric power, and application to railway motors.

114. RAILWAY ELECTRICAL ENGINEERING. Lectures and technical reports on the physical advantages of electric traction for train service, economies of electrification, choice and cost of equipment, physical valuations of electric roads, operating data, study of financial results.

115. JOURNAL READING. Weekly discussion of current electrical periodicals. SHEPARDSON.

116. JOURNAL READING. A continuation of Course 115. SHEPARDSON.

117. ELECTRICAL DESIGN. The design of direct current generators and motors, and alternating current transformers; complete working drawings and specifications to accompany each design. RYAN.

118. ELECTRICAL DESIGN. The design of alternating current generators and motors and switch-boards. RYAN.

152. ELECTRIC LIGHTING. Comparison of different sources of light, elements of measurement of light, distribution of light, choice of reflectors, elements of calculation of illumination. RYAN.

156. ELECTRIC POWER. Elementary principles of continuous currents. Continuous current generators and motors. Elementary principles of alternating currents. Alternating current generators, transformers, and motors. Measurement of power. Elementary principles of transmission and distribution. Lectures, recitations, and laboratory work. RYAN.

157. ELECTRIC POWER. An elementary study of the problems involved in the generation, distribution, measurement, and utilization of electric power. Lectures, recitations, and laboratory work, supplemented by numerous problems. RYAN.

158. Electric Power. A continuation of Course 157. Ryan.

203. Thesis. An investigation of some approved problem in electrical engineering. Shepardson, Springer, Ryan, Turner.

204. Thesis. A continuation of Course 203.

205. 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; emergencies. Ryan.

206. Electrical Transmission. Considerations involved in the designing and building of transmission lines, Kelvin's law and its limitations, the transmission line as a mechanical structure, lightning arresters, study of particular high-tension lines. Ryan.

208. Batteries and Electric Vehicles. Theory of the storage battery as used in electric trucks and automobiles; electric automobile equipment; electrical accessories for gasoline automobiles; charging devices, such as mercury arc and vibrating rectifiers and special synchronous converters. Ryan.

210. Electrical Equipment of Buildings Lectures on electrical equipment of modern office and factory buildings. Detailed study of plans and specifications. Inspection and reports on jobs under construction, and after completion. Special lecturers.

213-214. Transient Electric Phenomena. Transient phenomena accompanying a change of circuit conditions, with their differential equations: Abnormal currents, voltages, and frequencies produced by switching, short circuits, and arcing grounds; distributed capacity and inductance, standing waves, traveling waves, phenomena at transition points of complex circuits; power and energy of complex circuits. Turner.

215-216. Radio-Signaling. Maxwell's electromagnetic theory, experimental work of Hertz, phenomena of electric oscillations in simple and coupled circuits, generation and reception of damped and undamped waves, propagation of electro-magnetic waves through space, detectors, measuring instruments, effect of curvature of the earth, absorption by obstacles, attenuation with distance, types of antenna. Lecture and laboratory. Turner.

219. Telegraph and Telephone Apparatus. Theoretical and experimental study of apparatus used for signaling, telegraphy and telephony. Lecture and laboratory. Shepardson.

220. Telegraph and Telephone Circuits. Theoretical and experimental study of telephone circuits and the phenomena of telephonic transmission, applications of hyperbolic functions to line phenomena. Shepardson.

221. PRECISE ELECTRICAL ENGINEERING MEASUREMENTS. Lectures and laboratory work. Precise measurements of resistance, voltage, current, self-induction, and capacity, standardization of measuring instruments. SPRINGER.

222. PRECISE ELECTRICAL ENGINEERING MEASUREMENTS. A continuation of Course 221. SPRINGER.

223. ELECTROCHEMICAL ENGINEERING. Theoretical and experimental study of the engineering problems of electrolytic and electro-thermal processes. SHEPARDSON.

226. ILLUMINATING ENGINEERING. Lectures and laboratory work, investigation of performance of electric and gas lamps, reflectors and diffusers, luminous efficiency, distribution, color characteristics, physiological phenomena, methods of determining location, kind, and quality of lights for obtaining desired illumination. SHEPARDSON.

228. STEAM RAILROAD ELECTRIFICATION. American and European railroad electrification, engineering practice, detailed cost, equipment, electric power generation, purchased power contracts, studies of operating and financial results, technical reports on new projects. Studies of railroad electrification. Estimates and valuations.

229. ELECTRICAL LABORATORY. Efficiency tests and special problems. SHEPARDSON, SPRINGER.

230. ELECTRICAL LABORATORY. A continuation of Course 229. SHEPARDSON, SPRINGER.

232. ELECTRICAL DESIGN. Special problems. RYAN.

234. VALUATION OF ELECTRICAL PROPERTIES. Cost of organizing and securing capital, discounts on bonds, fees; franchise values. Depreciation and obsolescence, deferred maintenance. Public utilities, fair rates and returns, regulation of natural monopolies. PILLSBURY.

## EXPERIMENTAL ENGINEERING

Professor WILLIAM H. KAVANAUGH; Associate Professor ADOLPH F. MEYER; Assistant Professors CHARLES F. SHOOP, FRANKLIN R. McMILLAN; Instructor E. DOW GILMAN.

### COURSES

| No. | Title | Credits | Taken by | Prereq. courses |
|---|---|---|---|---|
| 101. | Materials Testing Laboratory.... | 2 | Jr. engrs. | Math. 151 |
| 102. | Hydraulic and Steam Laboratory. | 2 | Jr. engrs. | Math. 152 |
| 103. | Steam and Power Laboratory.... | 2 | Sr. M. E. | M. E. 130 |
| 104. | Power and Gas Engine Laboratory | 2 | Sr. M. E. | 103 |
| 105. | Steam and Power Laboratory.... | 2 | Sr. & p. sr. E. E. | 102 |
| 106. | Experimental Laboratory..... | 3 | Elective p. sr. C. E. | 102 |
| 107. | Steam Laboratory..... | 2 | Jr. E. M. & Met. E. | .. |

| No. | Title | Credits | Taken by | Prereq. courses |
|---|---|---|---|---|
| 108. | Advanced Hydraulic Laboratory.. | 1 | Elective | 102 |
| 110. | Materials Testing Laboratory.... | 2 | Jr. E. M. & Met. E. | .. |
| 112. | Experimental Laboratory..... | 2 | Sr. E. M. & Met. E. | 107 |
| 113. | Concrete Laboratory..... | 3 | Elective | 101 |
| 114. | Structural and Concrete Laboratory..... | 3 | Elective | 101 |
| 116. | Experimental Laboratory..... | 3 | Elective | 103 or 113 |
| 118. | Advanced Hydraulic Laboratory.. | 3 | Elective | 108 and C. E. 124 |
| 121. | Advanced Experimental Laboratory | 3 | P. sr. M. E. | 104 |
| 122. | Advanced Experimental Laboratory | 3 | P. sr. M. E. | 121 |
| 127. | Steam and Power Laboratory.... | 3 | P. sr. M. E. | 102 |
| 128. | Gas Engine Laboratory..... | 3 | P. sr. M. E. | 127 |

101. MATERIALS TESTING LABORATORY. Investigation of strength and physical properties of various metals and engineering materials, including wood, cement, concrete, ropes, cables, belting and chains. Supplemented by lectures on the various materials of construction and standard methods of testing. KAVANAUGH, MCMILLAN, SHOOP, GILMAN.

102. HYDRAULIC AND STEAM LABORATORY. Hydraulic measurements. Calibration of weirs, nozzles, orifices, and meters. Tests of water motors, rams; pulsometers; valve setting, indicator practice, calorimetry, study of lubricants, and introductory steam experiments. KAVANAUGH, SHOOP, GILMAN.

103. STEAM AND POWER LABORATORY. Calibration of dynamometers and measurement of power. Tests of injectors, ejectors, steam and power pumps, steam turbines, steam engines and boilers. KAVANAUGH.

104. POWER AND GAS ENGINE LABORATORY. Continuation of Course 103. Tests of complete power and lighting plants. Tests of gas, gasoline, and hot air engines, gas producers, air compressors. Automobile and locomotive testing. KAVANAUGH.

105. STEAM AND POWER LABORATORY. Tests of steam and power pumps. Measurement of power, tests of gas and steam engines, boilers and complete power and lighting plants. KAVANAUGH, SHOOP.

106 EXPERIMENTAL LABORATORY. Course in steam and gas engine laboratory arranged especially for the needs of municipal engineers. KAVANAUGH.

107. STEAM LABORATORY. Valve setting, indicator practice, calibration of gauges, calorimetry, efficiency tests of screws, hoists and other machines. SHOOP.

108. ADVANCED HYDRAULIC LABORATORY. Consisting of experimental and demonstration work with centrifugal pumps, reaction turbines, impulse wheels and spillways. MEYER.

110. MATERIALS TESTING LABORATORY. Abbreviated course, twelve weeks. Special modification of Course 101. MCMILLAN.

112. EXPERIMENTAL LABORATORY. (Twelve weeks' course.) Hydraulic measurements. Tests of water motors, rams, steam pumps, steam engines and boilers. KAVANAUGH.

113. CONCRETE LABORATORY. Aggregates, proportioning, field and laboratory methods of determining choice of materials and mixtures. Tests of plain and reinforced concrete members to determine quality of materials. MCMILLAN.

114. STRUCTURAL AND CONCRETE LABORATORY. Tests of structural elements of steel and reinforced concrete. Beams, columns, joints and frame structures. Building and bridge tests. MCMILLAN.

116. EXPERIMENTAL LABORATORY. Special research work and commercial tests, KAVANAUGH, MCMILLAN, SHOOP.

118. ADVANCED HYDRAULIC LABORATORY. Continuation of Course 108. Study of special hydraulic problems in the field and laboratory. MEYER.

121. ADVANCED EXPERIMENTAL LABORATORY. Continuation of Courses 103 and 104. Special problems, tests and investigations. KAVANAUGH.

122. ADVANCED EXPERIMENTAL LABORATORY. Continuation of Course 121. Special problems, tests and investigations. KAVANAUGH.

127. STEAM AND POWER LABORATORY. Calibration of dynamometers, and measurement of power, study of lubricants. Tests of injectors, ejectors, steam turbines, steam engines and boilers, and complete power and lighting plants. KAVANAUGH.

128. GAS ENGINE LABORATORY. Continuation of Course 127, also tests of gas, gasoline, and hot air engines, gas producers, air compressors. Automobile and locomotive testing. KAVANAUGH.

## FRENCH

Professor EVERETT W. OLMSTED; Assistant Professor JULES T. FRELIN; Instructor HARRY E. ATWOOD.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Beginning French | 3 | Fr. Architects | None |
| 2. | Beginning French | 3 | Fr. Architects | 1 |
| 3a,b. | Intermediate French | 6 | Fr. Architects | 1-2, or 2 yrs. preparation |

1. BEGINNING FRENCH. Stress on accurate pronunciation, reading vocabulary, and the essentials of grammar. Daily oral and written exercises (dictation and reproduction in French).

2. BEGINNING FRENCH. A continuation of Course 1.

3a,b. INTERMEDIATE FRENCH. Six hour semester course. Grammar, composition and reading, increased use of French in the classroom. Selections from modern prose and poetry. FRELIN, ATWOOD.

## GEOLOGY AND MINERALOGY

Professor WILLIAM H. EMMONS; Instructor TERENCE T. QUIRKE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | General Geology | 3 | Elective | None |

1. GENERAL GEOLOGY. Materials of the earth and geologic processes. Application of geology to engineering problems. Physiographic, dynamic, and structural geology, with a brief introduction to economic geology of structural materials. Lectures, map study, field excursions, and conferences. QUIRKE.

## MATHEMATICS AND MECHANICS

Professor WILLIAM E. BROOKE; Assistant Professors HANS H. DALAKER, WILLIAM F. HOLMAN, BURT L. NEWKIRK; Instructors JENNESS B. FREAR, GEORGE C. PRIESTER, JOHN S. TURNER.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 69–70. | Special Course in Alg. and Trig. | 5 | Fr. not in 71a | .. |
| 71a,b. | Algebra and Trigonometry | 5 | Fr. | .. |
| 72. | Analytic Geometry | 5 | Fr. | 71 |
| 73a,b. | Differential Calculus | 5 | Soph. | 72 |
| 74. | Integral Calculus | 5 | Soph. | 73 |
| 75. | Technical Mechanics—Statics | 3 | Jr. | 74 and Phys. 7 and 8 |
| 76. | Technical Mechanics—Dynamics | 3 | Jr. | 75 |
| 91. | Mechanics | 4 | Soph. Arch. | 72 |
| 92. | Strength of Materials | 4 | Soph. Arch. | 91 |
| 95. | Applications of Calculus | 3 | Elective | 74 |
| 151. | Mechanics of Materials | 3 | Jr., sr. | 75 or with 75 |
| 152. | Hydraulics | 3 | Jr., sr. | 76 or with 76 |
| 153. | Thermodynamics | 3 | Sr. M. E. | 152 |
| 154. | Steam and Water Turbines | 3 | Elective, sr. M. E. | 153 |

69-70. SPECIAL COURSE IN ALGEBRA AND TRIGONOMETRY. Fundamental rules, fractions, linear simultaneous equations, graphs, theory of exponents, surds, imaginaries, quadratic equations, binomial theorem, graphical solution of numerical equations of higher degree, logarithms, use of slide-rule. Trigonometric functions. TURNER.

71a,b. ALGEBRA AND TRIGONOMETRY. Graphical solution of numerical equations of higher degree, logarithms, use of slide-rule. Trigonometric functions and tables, addition theorem and relations, plane triangles and their solution by tables and slide-rule. Applications to surveying and statics. DALAKER, FREAR, PRIESTER, TURNER.

72. ANALYTIC GEOMETRY. Rectilinear and polar coördinates, the straight line and circle, transformation of coördinates, conic sections and other loci, slopes, tangents, derivatives, empirical curves, the elements of geometry of three dimensions. FREAR, PRIESTER, TURNER.

73a,b. DIFFERENTIAL CALCULUS. Derivatives, maxima and minima, expansion of functions, curvature; with applications to mechanical and physical problems. DALAKER, HOLMAN, FREAR, PRIESTER.

74. INTEGRAL CALCULUS. Integration of standard forms. Integration as a summation. Application to length of curves, areas, volumes. Approximate integration, Simpson's rule. Solution of some differential equations. Application to engineering problems. DALAKER, HOLMAN, FREAR, PRIESTER.

75. TECHNICAL MECHANICS. Statics. Resolution of forces, moments, conditions of equilibrium, free body method, center of gravity, moment of inertia, stresses in framed structures and in machines. NEWKIRK, HOLMAN, PRIESTER.

76. TECHNICAL MECHANICS. Dynamics. Dynamics of a particle, including Newton's laws of motion and kinematics of circular, harmonic, and curvilinear motion in general. Theorems of work and energy, impulse and momentum, and d'Alembert's principle. Elementary dynamics of rigid bodies. HOLMAN, NEWKIRK, PRIESTER.

91. MECHANICS FOR ARCHITECTS. (Designed for those who have not taken Calculus.) Laws of motion, énergy, work, resolution of forces, conditions of equilibrium, center of gravity, moment of inertia of plane sections, stresses in framed structures. HOLMAN.

92. STRENGTH OF MATERIALS. (Designed for those who have not taken Calculus.) Mechanical and elastic properties of materials of construction, design of riveted joints, beam theory, columns. HOLMAN.

95. APPLICATIONS OF CALCULUS. Problems selected from engineering subjects. BROOKE.

151. MECHANICS OF MATERIALS. Mechanical and elastic properties of materials of construction, beams, shafts, columns, combined stresses, hollow cylinders and spheres, rollers, plates, true stresses, theory of internal stress. BROOKE, HOLMAN, NEWKIRK, PRIESTER.

152. 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. BROOKE, HOLMAN, NEWKIRK, PRIESTER.

153. THERMODYNAMICS. The mechanical theory of heat as applied to steam, oil, gas and hot-air engines and to compressors, including use of steam tables and entropy diagrams. BROOKE.

154. STEAM AND WATER TURBINES. Various types of steam turbines;

velocity, impulse, and reaction. Nozzles, vanes, discs, bearings, governors. Thermodynamic analysis and efficiency. Theory of the operation, construction, and regulation of water turbines. Selection of turbine for given conditions. BROOKE.

For elective and advanced courses in mathematics and mechanics, see Bulletin of the Graduate School.

## MECHANICAL ENGINEERING

Professor JOHN J. FLATHER; Assistant Professors JOHN V. MARTENIS, FRANK B. ROWLEY, S. CARL SHIPLEY; Instructors WALLACE H. MARTIN, EDWARD QUIGLEY, WILLIAM H. RICHARDS.

### COURSES

| No. | Title | Credits | Taken by | Prereq. courses |
|---|---|---|---|---|
| 1–2. | Elementary Shop Practice | 4 | Fr. Engrs. | .. |
| 3a,b. | Pattern Making and Foundry Practice | 3 | Soph. M. E. & E. E. | 1-2 |
| 4a,b. | Machine Shop Practice | 3 | Soph. E. E. | 3 |
| 6. | Machine Shop Practice | 2 | Soph. M. E. | 3 |
| 5. | Advanced Machine Shop Practice | 4 | Jr. M. E. | 4 |
| 7a,b. | Industrial Management Laboratory | 2 | P. sr. elective | 111 |
| 15. | Mechanism and Kinematics | 4 | Jr. M. E. | Math. 74 |
| 16. | Mechanism and Kinematics | 2 | Jr. E. E. | Math. 74 |
| 19. | Mechanical Technology | 1 | Soph. M. E. | Tech. 1-2 |
| 111a,b. | Industrial Management | 2 | P. sr. M. E. | .. |
| 113a,b. | Power Plant Operation | 1 or 2 | P. sr. elective | .. |
| 115. | Power Engineering | 3 | P. sr. M. E. | 129, 132 |
| 116. | Machine Design | 4 | Jr. M. E. & sr. E. E. | Math. 76 |
| 117. | Machine Design, valve gears | 2 | Sr. M. E. | Math. 76 |
| 119. | Automobiles and Gas Tractors | 3 | P. sr. elective | 124 |
| 121. | Steam Engine Design | 3 | P. sr. elective | .. |
| 123. | Gas Engine Design | 3 | P. sr. elective | 19 |
| 124. | Internal Combustion Engines and Gas Producers | 3 | Sr. M. E. | Chem. 38 |
| 125a,b. | Tool Design | 3 | P. sr. elective | 5 |
| 126. | Adv. Machine Design | 4 | P. sr. M. E. | 116 |
| 127a,b. | Power Plant Design | 3 | P. sr. elective | 116, 129 Math. 152; E. E. 158 |
| 129. | Steam Engines and Boilers | 3 | Sr. M. E. & E. E. | Math. 151 |
| 131a,b. | Steam Engines and Boilers | 3 | Elective | Math. 151 |
| 132. | Measurement of Power | 2 | P. sr. elective | Math. 152 |
| 133. | Heating and Ventilating | 2 | P. sr. elective | Math. 153 |
| 134. | Heating and Ventilating | 2 | Sr. Arch. | Physics 8 |
| 136. | Compressed Air and Refrigerating Machinery | 2 | P. sr. elective | Math. 153 |
| 138. | Contracts and Specifications | 1 | P. sr. M. E. | .. |
| 139. | Railway Technology | 2 | P. sr. elective | .. |
| 140. | Safety Engineering | 2 | P. sr. elective | 111 |
| 141. | Railway Design | 3 | P. sr. elective | 139 |
| 142. | Railway Design | 3 | P. sr. elective | 141 |
| 143. | Locomotive Construction | 1 | P. sr. elective | 139 |
| 144. | Locomotive Construction | 1 | P. sr. elective | 139 |
| 145. | Locomotive Road Testing | 3 | P. sr. elective | Regis. in 141 |

| No. | Title | Credits | Taken by | Prereq. courses |
|---|---|---|---|---|
| 147a, b. | Mechanical Equipment of Buildings | 3 | Sr. or p. sr. elective | Physics 8 |
| 149. | Seminar | 1 | P. sr. elective | .. |
| 150. | Seminar | 1 | P. sr. elective | .. |

1. ELEMENTARY SHOP PRACTICE. A general course in shop work, which includes pattern making, foundry, forge, and machine work. SHIPLEY, GRANT, QUIGLEY, RICHARDS.

2. ELEMENTARY SHOP PRACTICE. Continuation of Course 1.

3a,b. PATTERN MAKING AND FOUNDRY PRACTICE. Patterns for parts of steam and gas engines, machine tools, and special machinery; molding, core making, mixing for the casting of machine parts in iron, brass, bronze and aluminum. Machine molding and special processes. RICHARDS.

4a,b. MACHINE SHOP PRACTICE. Machine operations. Manufacturing methods. Shop practice, lectures, and recitations. SHIPLEY and Assistants.

5. ADVANCED MACHINE SHOP PRACTICE. Machine and tool construction, jigs, fixtures, and special problems. Summer course of four weeks, during the vacation period following the sophomore year. SHIPLEY and Assistants.

6. MACHINE SHOP PRACTICE. Course 4a condensed. SHIPLEY and Assistants.

7a,b. INDUSTRIAL MANAGEMENT LABORATORY. An advanced course in shop practice with especial reference to production. Time studies; stores and follow-up systems. Investigations in local factories. Lectures, assigned reading, practice and reports. FLATHER and SHIPLEY.

15. MECHANISM AND KINEMATICS. Transmission of motion. Levers, gearing, linkwork, belts, screws, epicyclic trains, parallel motions, quick-return movements. The paths, speeds, and accelerations of important mechanisms; centroids, analysis of mechanisms; cams; roulettes, tooth profiles; kinematic pairs; machine parts. MARTENIS.

16. MECHANISM AND KINEMATICS. The transmission of motion without consideration of the strength of parts. Levers, gearing, linkwork, kinematic pairs; machine parts, construction of tooth profiles. A short course arranged for electrical engineers. MARTENIS.

19. MECHANICAL TECHNOLOGY. A study of mechanical processes involved (a) In various manufacturing industries; (b) In the production of materials of construction, including the metallurgy of iron and steel; and (c) In the development and utilization of power. Lectures by members of the department and others.

111a,b. INDUSTRIAL MANAGEMENT. Shop and factory organization and

management; cost and wage systems. Depreciation of equipment. Machine burden. Time studies. FLATHER.

113a,b. POWER PLANT OPERATION. Operation and maintenance of boilers, engines, gas producers, gas engines, steam turbines, and accessory apparatus. Smoke prevention. Flue gas analysis. Power costs. MARTENIS, RYAN, and Assistants.

115. POWER ENGINEERING. An advanced study and application of engines, stokers and boilers; coal handling equipment and accessories. Layout of manufacturing shops. Routing of work, transmission systems and selection of motors, factory lighting and heating. Lectures, recitations and drawing room work. FLATHER.

116. MACHINE DESIGN. Calculation and design of such machine parts as fastenings, bearings, rotating pieces, pulleys, spur gearing, bevel gears, spiral gears, and rope driving. Recitations, lectures and drawing room practice. FLATHER, MARTENIS and Assistants.

117. MACHINE DESIGN. Application of graphical methods to the design of valve gears and link motions. FLATHER, MARTENIS, and Assistants.

119. AUTOMOBILES AND GAS TRACTORS. A study of the mechanical problems involved in automobiles, trucks and tractors with particular attention given to starting and ignition devices, carbureters, lubrication, cooling, and transmissions. Laboratory experiments will be made in connection with the course. SHIPLEY.

121. STEAM ENGINE DESIGN. Calculations and working drawings for a high speed automatic or Corliss steam engine. Theoretical diagrams and determination of details. FLATHER, MARTIN.

123. GAS ENGINE DESIGN. Calculations and working drawings for a single cylinder stationary gas engine. Theoretical diagrams and details of parts. FLATHER, MARTIN.

124. INTERNAL COMBUSTION ENGINES AND GAS PRODUCERS. Principles of two and four cycle operation. Otto, semi-Diesel and Diesel. Mechanism of stationary, automobile and tractor engines. Carburation, ignition, governing, starting mechanism, cooling, lubrication, types of transmissions and differentials. Gas producers, types and principles of operation, suction, pressure, blast furnace. By-product recovery. MARTIN.

125a,b. TOOL DESIGN. Design of tools for manufacturing interchangeable parts; jigs and milling fixtures. FLATHER.

126. ADVANCED MACHINE DESIGN. Original design, including machinery for changing size and form, cranes, pumping, transmission machinery and engineering appliances. Lectures, problems and drawing room practice. FLATHER, MARTIN.

127a,b. POWER PLANT DESIGN. Problems, designs and estimates for

power plants and central stations. Selection of motive powers, relative advantages of steam and producer gas plants, choice of engines and boilers; pumps, shafting, piping and accessories. FLATHER.

129. STEAM ENGINES AND BOILERS. Steam boilers, settings, furnaces, stokers, smoke prevention, chimneys, evaporation. Mechanics of steam engine; work in cylinder; reciprocating parts; steam distribution; indicator cards, mechanism of steam engine; slide valve, Zeuner diagram, Corliss valves; governors; compounding, steam turbines. FLATHER, MARTIN.

131a,b. STEAM ENGINES AND BOILERS. Course 129 condensed.

132. MEASUREMENT OF POWER. A study of the methods employed in measuring power. Dynamometers; railway dynamometer cars, friction brakes; power required to drive machine tools and shafting. FLATHER.

133. HEATING AND VENTILATING. Principles of heating and ventilating. Construction and operating of heating apparatus. Steam, hot water, exhaust, vacuum, and fan systems. Lectures, recitations and designs. MARTENIS.

134. HEATING AND VENTILATING. A course for architects. MARTENIS.

136. COMPRESSED AIR AND REFRIGERATING MACHINERY. (a) Air compressors and motors, and transmission of power by compressed air. (b) Principles of refrigeration. Various types of refrigerating machines, refrigerants, and applications to ice making, cold storage, cooling of air, liquids, and solids. Lectures and recitations. MARTENIS.

138. CONTRACTS AND SPECIFICATIONS. A study of engineering specifications. Classes of specifications; essential features; clauses; details. Bids and bidders; engineering contracts. Examples. Lectures, recitations and practice in writing specifications. FLATHER.

139. RAILWAY TECHNOLOGY. The practical details of construction of locomotives. A systematic course of visits to the various railroad shops in the vicinity; lectures and recitations. MARTENIS.

140. SAFETY ENGINEERING. A study of the methods employed to promote safety in the factory; fire hazards, fire protection; automatic sprinkler apparatus; workmen's compensation laws. SHIPLEY.

141. RAILWAY DESIGN. Locomotive and car details; the locomotive boiler, linkages, and assembled parts. FLATHER, MARTENIS.

142. RAILWAY DESIGN. Continuation of Course 141.

143. LOCOMOTIVE CONSTRUCTION. Design and construction of locomotives. Carriage; frames, springs, equalizing arrangements, running gear, brakes, trucks, lubrications. Boilers; proportions, grates, flues, smoke-

box, stacks; riveted joints, bracing, staying. Engine details; heat insulation, cylinder proportions. Lectures and assigned reading. FLATHER.

144. LOCOMOTIVE CONSTRUCTION. Continuation of Course 143.

145. LOCOMOTIVE ROAD TESTING. Tests on locomotives and trains. Dynamometer car and drawbar pull. FLATHER and Assistants.

147a,b. MECHANICAL EQUIPMENT OF BUILDINGS. Appliances used; heating, ventilating, plumbing systems; piping for fire protection, compressed air, gas and vacuum cleaning; elevators. Choice of systems. Theory and practice of designing and detailing layouts. Equipment designs for various types of buildings. MARTENIS, ROWLEY.

149. SEMINAR. FLATHER, MARTENIS, MARTIN.

150. SEMINAR. FLATHER, MARTENIS, MARTIN.

## METALLURGY

Professor WILLIAM R. APPLEBY; Assistant Professor SAMUEL L. HOYT.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 158. | Metallography for Engineers..... | 3 | Elective sr. or p. sr. | .. |
| 159. | Metallography for Engineers..... | 2 | Sr. M. E. | .. |
| 162. | Advanced Metallography..... | 3 | Elective | 158 or 159 |

158. METALLOGRAPHY FOR ENGINEERS. Metallurgy of iron and steel. Microscopic and thermal analysis of steel and cast iron; heat and mechanical treatment. The properties of iron and steel as affected by composition and treatment. Laboratory work. HOYT.

159. METALLOGRAPHY FOR ENGINEERS. Same as above but more condensed. HOYT.

162. ADVANCED METALLOGRAPHY. Metallography applied to engineering practice; machine design, structural engineering, electrical engineering. Engineering specifications involving the use of metals and alloys. HOYT.

## MILITARY SCIENCE AND TACTICS

Professor and Commandant BERNARD LENTZ; Assistant Commandant and Brigade Adjutant WALTER F. RHINOW; Band Instructor BERT L. ROSE.

1. MILITARY DRILL.

Freshman: Instruction in schools of the soldier, company, and battalion; signals, ceremonies; school of the cannoneer and battery.

Sophomore: Instruction in schools of the company and battallion; advance and rear guard drill; instruction in guard duty. Gallery practice. Target practice. Ceremonies.

NOTE: Military drill may be taken as an approved elective by others outside of the freshman and sophomore classes; a year's drill counts as a three-hour credit for one semester. Students who register for drill beyond the required amount must register for the entire year and will be subject to the same regulations as other cadets. No credit will be allowed for such drill for less than one year.

8. MILITARY SCIENCE. Instruction in advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records. LENTZ.

## PHYSICS

Professors HENRY A. ERIKSON, ANTHONY ZELENY; Assistant Professor LOUIS W. MCKEEHAN; Instructors ARTHUR H. COMPTON, ERNEST O. DIETERICH, PAUL E. KLOPSTEG.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | General Physics | 3 | Soph. Arch. | Math. 72 |
| 2. | General Physics | 3 | Soph. Arch. | 1 |
| 3. | General Laboratory Practice | 1 | Soph. Arch. | Regis. in 1 |
| 4. | General Laboratory Practice | 1 | Soph. Arch. | See statement |
| 7. | General Physics | 4 | Soph. Engrs. | Math. 72 |
| 8. | General Physics | 4 | Soph. Engrs. | 7 See statement |
| 9. | General Laboratory Practice | 1 | Soph. Engrs. | Regis. 7 |
| 10. | General Laboratory Practice | 1 | Soph. Engrs. | Regis. 8 |
| 162a. | Electrical Measurements | 2 | Jr. E. E. | 8, 10 |

1. GENERAL PHYSICS. Mechanics of solids and fluids, sound, and heat. Treatment experimental rather than mathematical; the fundamental principles. The first part of a general course 1-2. Should be taken in conjunction with Course 3, but may be taken separately. One lecture, two recitations per week. ZELENY, DIETERICH, KLOPSTEG.

2. GENERAL PHYSICS. Light, electricity, and magnetism. Treatment experimental; the fundamental principles, including those of radioactivity, ionization, X-radiation, and the electrical constitution of matter. The second part of a general course 1-2. Should be taken in conjunction with Course 4, but may be taken separately. One lecture, two recitations per week. ZELENY, DIETERICH, KLOPSTEG.

3. GENERAL LABORATORY PRACTICE. Physical measurements in the mechanics of solids and fluids, sound, and heat, giving the student a knowledge of experimental methods, and an acquaintance with the fundamental facts of the subject. MCKEEHAN, DIETERICH.

4. GENERAL LABORATORY PRACTICE. Physical measurements in light, electricity and magnetism. Open to all who have completed or are taking Course 2, and have attended Course 3 or 9. MCKEEHAN, DIETERICH.

7. General Physics. Mechanics of solids and fluids, sound, and heat; numerous problems to illustrate the principles. Must be taken in conjunction with Course 9. The first part of a general course 7-8, 9-10. One lecture, three recitations per week. Erikson, Compton.

8. General Physics. Light, electricity and magnetism. Must be taken in conjunction with Course 10. The second part of a general course 7-8, 9-10. One lecture, three recitations per week. Erikson, Compton.

9. General Laboratory Practice. Physical measurements in the mechanics of solids and fluids, sound, and heat. Must be taken in conjunction with course 7. McKeehan, Compton.

10. General Laboratory Practice. Physical measurements in light, electricity, and magnetism. Must be taken in conjunction with Course 8. McKeehan, Compton.

162a. Electrical Measurements. Devoted mainly to the study of capacity, inductance, and magnetic induction. Zeleny.

For electives in the Department of Physics see Bulletin of the College of Science, Literature, and the Arts.

## POLITICAL SCIENCE

Professor William A. Schaper; Assistant Percival W. Viesselman.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 25. | American Government | 3 | | None |
| 26. | Business Law | 3 | | 25 |

25. American Government. An introductory course in Political Science, dealing with forms of government. The development, organization, and actual workings of national, state and local government in the United States. Viesselman.

26. Business Law. A course in business law, arranged for engineers, including the law of contracts, suretyship, agency, partnership, corporations, negotiable instruments, conveyances, patents, and riparian rights. Viesselman.

## RHETORIC AND PUBLIC SPEAKING

Professor Joseph M. Thomas; Assistant Professor Charles W. Nichols; Instructor Howard T. Viets.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 3. | Rhetoric and Composition | 3 | Fr. | None |
| 4. | Rhetoric and Composition | 3 | Fr. | 3 |
| 31. | Technical Writing | 2 or 3 | Elective | .. |
| 32. | Technical Writing | 2 or 3 | Elective | .. |

3. RHETORIC AND COMPOSITION. Training in writing; study of the work of writers who have handled scientific subjects with clearness and power; outside reading. NICHOLS, VIETS.

4. RHETORIC AND COMPOSITION. A continuation of Course 3. NICHOLS, VIETS.

31. TECHNICAL WRITING. A course in technical writing, planned to meet the professional needs of engineering students. NICHOLS.

32. TECHNICAL WRITING. A continuation of Course 31. NICHOLS.

## TECHNOLOGY

Professors: The Faculty of the College of Engineering and others.

COURSES

| No. | Title | Credits | Required of | Prereq. courses |
|---|---|---|---|---|
| 1–2. | Technology | 2 | Fr. Eng. | .. |

1-2. TECHNOLOGY. Lectures covering the various fields of engineering, efficiency in study, hygiene, and on the conduct of life. Visits to factories, machine shops, power plants, existing engineering works, and those under construction. Reports.

## SUMMER READING

All engineering students are advised to take general courses in reading of a non-professional character during the summer vacations following the freshman and sophomore years. The purpose of the summer reading is to increase the acquaintance of the student with literature, history, and general science; to develop in him a taste for good reading; and to impress him with the importance of such knowledge not only as a source of individual enjoyment but as a practical aid to engineers in their social and business relations.

A circular on summer reading has been prepared and will be issued prior to the summer vacation. This contains a list of books from which the student may make his own selection. The books have been chosen for their value in providing general training, but an attempt has been made to include only readable and attractive works. Most of the books in the list are available in standard low priced editions, and each student is urged to purchase his own copy and thus add to the value and pleasure of the reading. A statement of the books read during the summer is required at the beginning of the next college year. In addition the student may be asked to give the substance of the books read and his impressions concerning them. One credit will be allowed for each course satisfactorily completed.

# Bulletin of The University of Minnesota

# THE COLLEGE OF AGRICULTURE

## 1916-1917

VOL. XIX. NO. 6. JULY 1916

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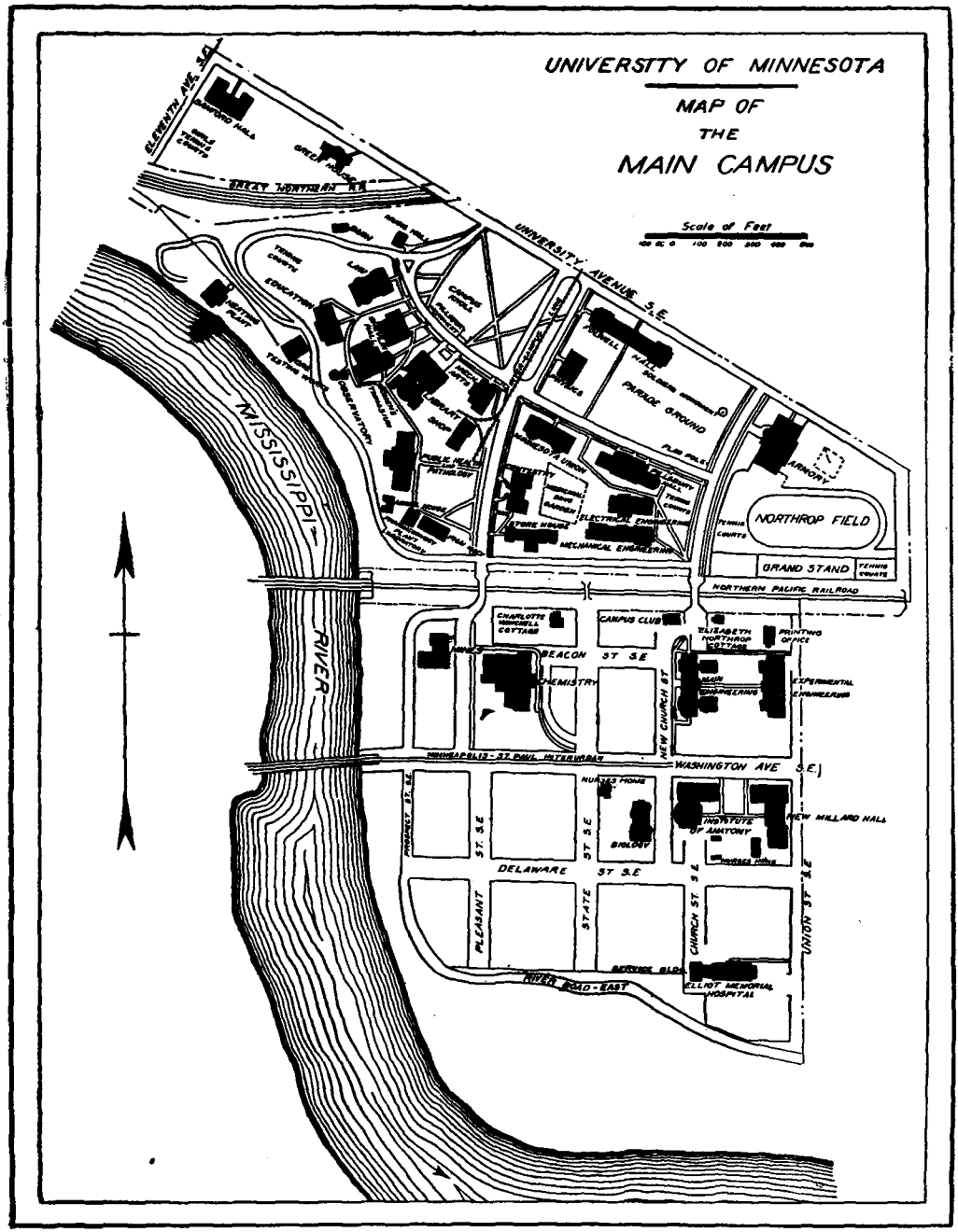
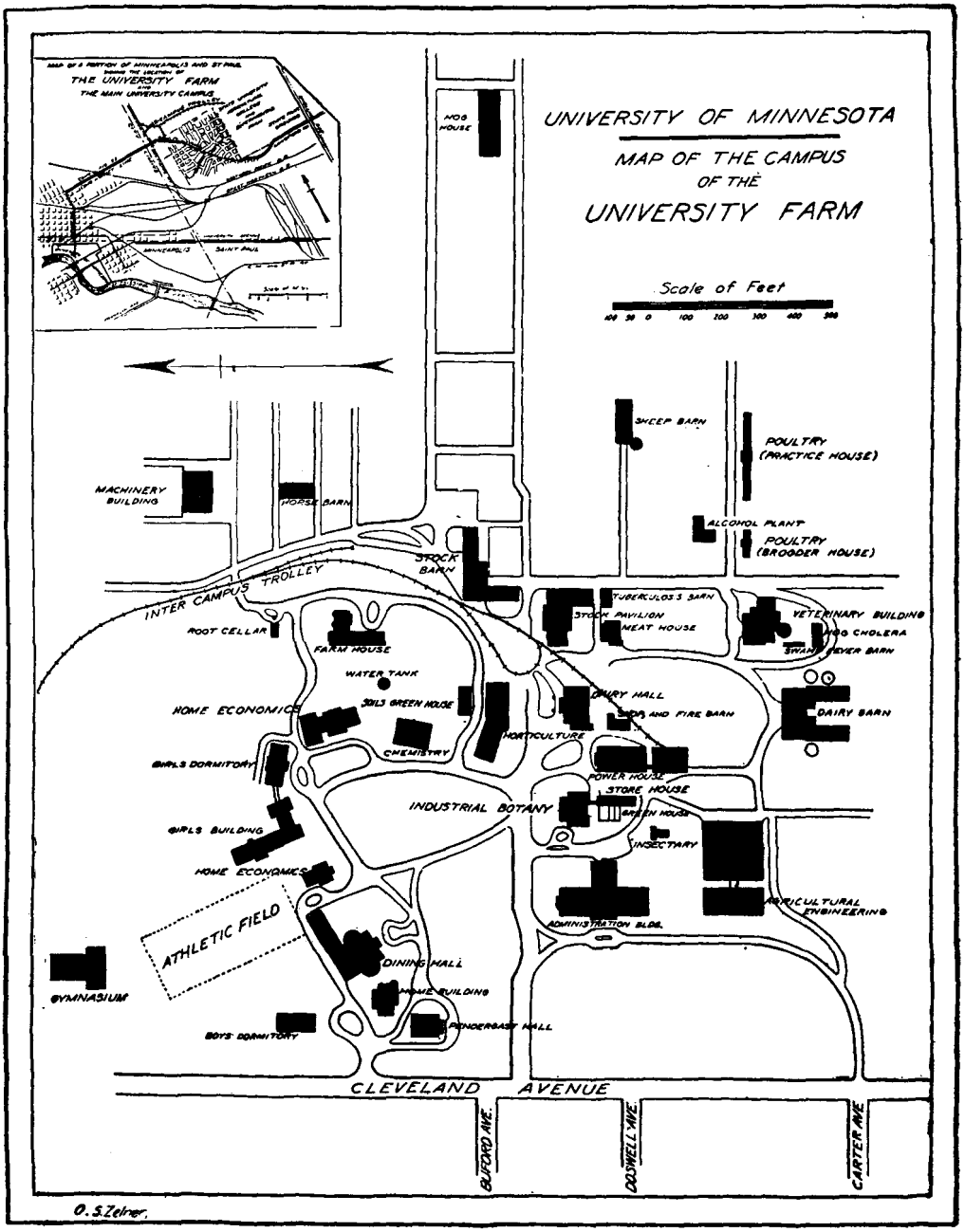



Area of Main Campus, 108.5 acres




Area of University Farm, 422.56 acres

## 1916

### JULY

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## 1917

### JANUARY

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### JULY

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### AUGUST

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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# CALENDAR

## COLLEGE OF AGRICULTURE

### 1916-17

The College year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

The School of Agriculture year covers a period of twenty-four weeks beginning on the first Monday in October. Commencement Day is the last Thursday in March.

Numerous short courses are held of from one to five weeks' duration.

| | | | |
|---|---|---|---|
| September | 13 | Wednesday | Registration closes except for new students |
| September | 18 | Monday | Entrance examination in Farm Practice |
| September | 19-26 | Week | Entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations (not for admission) |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| October | 13 | Friday | Half holiday. Annual freshman-sophomore contest |
| October | 21 | Saturday | Last day for removal of second semester incompletes |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |

| | | | |
|---|---|---|---|
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |
| February | 6 | Tuesday | Registration and payment of fees for second semester closes. All grades for first semester due in Secretary's Office |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 3 | Saturday | Last day for removal of first semester incompletes |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | First semester condition examinations |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 16 | Saturday | Entrance examination in Farm Practice |
| June | 18 | Monday | Summer Session and Teachers' Training School begin |
| July | 4 | Wednesday | Independence Day; a holiday |
| July | 28 | Saturday | Summer Session and Teachers' Training School close |
| July 30-Aug. | 4 | Week | Rural Life Conference |

The University year for 1917-1918 will begin Tuesday, September 18.

# THE COLLEGE OF AGRICULTURE

## FACULTY

GEORGE EDGAR VINCENT, Ph.D., LL.D., President
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RODNEY M. WEST, B.A., Secretary 2141 Doswell Ave., St. Paul

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MAXWELL J. DORSEY, Ph.D., Associate Professor of Horticulture
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E. DANA DURAND, Ph.D., Professor of Economics
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* Absent on leave 1916-17.

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2223 Knapp St., St. Paul
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Lexington-Concord Apts., Minneapolis
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CLAYTON O. ROST, M.A., Instructor in Soils
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LLOYD R. WHITSON, E.M., Instructor in Drawing
1721 4th St. S. E., Minneapolis
EVERETT H. DOHERTY, B.S., Assistant in Agricultural Chemistry
2334 Como Ave. W., St. Paul

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*GEORGE J. BAKER, M.S. in Agr., Demonstration Farm Specialist
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FRANK E. BALMER, B.S. in Agr., State Leader County Agricultural Agents
2266 Carter Ave., St. Paul
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Leamington Hotel, Minneapolis
MARY L. BULL, Home Economics Specialist 2150 Carter Ave., St. Paul
HARVEY M. BUSH, Farmers' Club Specialist 2176 Scudder Ave., St. Paul

* Absent on leave 1916-17.

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2316 Pierce Ave., St. Paul
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2089 Carter Ave., St. Paul
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## FACULTY COMMITTEES

### 1916-17

*Executive Committee.*—Dean, Secretary, Chiefs of Divisions
*Enrollment.*—West, Mowry, Biester, Wentling, Bender, Pierce
*Curriculum and Catalog.*—Freeman, Boss, Storm, West, Stewart, Berry
*Program.*—Stewart, Mowry, Williams
*Students' Work.*—Freeman, West, Berry, Cheyney, Sweeney, Ruggles
*Library.*—Alway, Wellington, Stakman, Sewall, Lansing, Howard
*Research.*—Thatcher, Freeman, Dorsey, Alway, Stakman, Hayes
*Student Organizations.*—Lansing, Berry, Cheyney, Weller, Freeman
*Athletics.*—Oswald, Montgomery, Boyd, Cheyney, Peck
*Demonstration and Exhibit.*—R. M. Washburn, C. P. Bull, Allison, Trilling, Smith, Jager, Mackintosh, F. L. Washburn
*Sanitation.*—Reynolds, Mayne, Wheeler, C. W. Howard, Laue
*Grounds.*—Boss, Cady, Stewart, Oswald
*Genetics.*—Dorsey, Hayes, Smith, Stakman
*Short Course.*—Storm, Mayne, R. M. Washburn, Brierley, Berry, Stewart, Boss, Kirkwood, West
*Auditing.*—Roe, Peck, Lusk
*Publications.*—Wilson, Boss, Haecker, Freeman, Thatcher
*Faculty Business.*—Lusk, Moore, Cheyney, Wheeler
*Delayed English Credit.*—Lansing, Glick, Mohl, Cook
*Appointment.*—Storm, Berry, Gehrand, Arny

# GENERAL INFORMATION

## ADMISSION

New students are admitted at the opening of the first semester in September and the second semester in February.

All students entering for the first time shall submit their credentials to the Enrollment Committee.

Admission is either by certificate or by examination. Candidates must have completed the equivalent of a four-year high school course and must present:

1. Four units of English; or three units of English and four units of a foreign language; or three units of English and two units in each of two foreign languages.
2. One unit of Algebra and one unit of Plane Geometry.
3. Enough additional work to make in all fifteen units, of which not more than four may be in vocational subjects.
4. For and after the college year 1916-17 a working knowledge of the fundamental operations of the farm, such as harnessing horses, milking cows by hand, plowing, planting, and harvesting the common crops, for admission to the Agricultural courses. It is provided, however, that students transferring from other colleges or universities to the junior year of any of the special science courses, will be exempt from this requirement.

For details of admission requirements, see the Bulletin of General Information.

In addition to the knowledge of farm practice required for admission every prospective student for any of the Agricultural courses 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.

Applicants for admission to both the Agricultural and Home Economics courses are urged to present Physics (1 unit), Chemistry (1 unit), and, those entering any of the Agricultural courses, Higher Algebra (½ unit), for entrance credits. If these subjects are not completed in the high school, they will have to be taken in the University, thus postponing some of the vocational courses.

## FEES

| | Agriculture | Home Economics |
|---|---|---|
| Incidental semester fee, | | |
| Residents of Minnesota | $20.00 | $20.00 |
| Non-residents | 40.00 | 40.00 |
| Deposit (first semester only) | 5.00 | 5.00 |
| Military Deposit (freshman or sophomores, first semester in residence only) | 15.00 | .... |

| | | |
|---|---|---|
| Gymnasium (per semester) | 1.50 | *.50 |
| Minnesota Union (per semester) | 1.00 | .... |
| Special fees, | | |
| Examination for removal of conditions | 1.00 | 1 00 |
| Examinations for credit (after the first semester in residence) | 5.00 | 5.00 |
| Special examinations | 5.00 | 5.00 |
| Change of registration | 2.50 | 2.50 |

*Late Registration.*—Old students must indicate their registration not later than two weeks before the day set for classes to begin. All students must complete their registration (including payment of fees) before the day set for classes to begin. Penalty for delay in either indicating or completing registration, one dollar. An additional twenty-five cents is charged for each day of delay after the last day set for the completion of registration and a similar charge 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 semester opens except by special committee action.

## REQUIREMENTS FOR GRADUATION AND DEGREES

After the completion of the prescribed course of study, including all of the required work and the requisite amount of elective work equivalent to a total of 144 credit hours for the Agricultural courses and 132 credit hours (136 for those graduating in June, 1917), for the Home Economics courses, candidates will be recommended for graduation with the degree of Bachelor of Science. The diploma will designate the college in which the candidate completes the work for his degree and his major line of work.

## PROFESSIONAL CERTIFICATES

The University State Teachers' Certificate is granted to graduates of the College of Agriculture who have completed fifteen credit hours in approved professional courses.

The Industrial Certificate, which all Minnesota high school teachers of agriculture or home economics are required to have, is granted by the State Department of Education to graduates of the College of Agriculture who are recommended by the College and who have completed the professional training required by the regulations of the State Department of Education for special teachers in Agriculture or Home Economics.

Students desiring this industrial certificate in Agriculture should consult the Chief of the Division of Agricultural Education before registering for the work of the junior year. Those desiring the industrial certificate in Home Economics should consult the Chief of the Division of Home Economics.

## FACULTY REGULATIONS

The regulations of the faculty are published in a separate booklet which will be issued at the time of registration. Students are held responsible for compliance with all of these regulations.

# COURSES OF STUDY

## GENERAL AGRICULTURE

For Home Economics, see page 74.

Students are especially urged to read *carefully* the following general instructions and to refer to them frequently during the college course.

Six months' practical farm experience is required of each candidate for graduation in all courses in Agriculture unless satisfactory credentials for previous farm experience are presented.

Students are urged to decide *as early as possible* in what line of work they intend to specialize, and to consult with the faculty of the division in regard to all matters pertaining to their future work, such as electives, farm experience, and the possibilities for preparing especially for distinct fields of work. Students should make at least a tentative decision in regard to their line of specialization before the end of the freshman year. Final decision on the line of specialization does not need to be made, however, until the end of the sophomore year. Students in doubt in regard to specialization should consult the Chairman of the Students' Work Committee or the chiefs of various divisions offering special lines.

Two groups of courses of study are offered:

1. General agricultural courses of study, in which students prepare for general agricultural pursuits, as farming, stock-raising, dairying, or teaching agriculture in secondary schools. Specialists who intend to prepare for experiment station or other research work along these lines will find it necessary to pursue graduate work. The following general agricultural courses of study are offered:

Agricultural Education
Agricultural Education—Manual Training
Agronomy and Farm Management
Dairy and Animal Husbandry
Horticulture

2. Special agricultural science courses of study, in which students prepare for special purposes, usually scientific research. In all of these courses graduate work is necessary for a thoro preparation. The following special agricultural science courses of study are offered:

Agricultural Chemistry
Agricultural Economics
Entomology and Economic Zoology
Plant Pathology
Soils

The freshman year is alike in all courses. In the sophomore year one half of the subjects are alike in all courses, while in the junior year a considerable amount of difference exists. The senior year is almost en-

tirely devoted to special subjects and electives. The regular amount of work is eighteen credit hours for each semester of all courses and the total amount for graduation is one hundred and forty-four credit hours. Students are requested to note carefully both (a) *the general requirements for all students* and (b) *the special requirements for the different courses of study.*

## GENERAL REQUIREMENTS FOR ALL STUDENTS IN AGRICULTURE

### EXPLANATION OF COURSE NUMBERS

Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. In the case of courses repeated the second semester, the suffix *a* indicates first semester; the suffix *b*, second semester.

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.

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 semester.

### FRESHMAN YEAR

All students must register for group A and enough additional work from group B to make a total of not more than 18 credit hours each semester. All courses in group B, except such options as are indicated, not completed in the freshman year must be registered for in the sophomore year.

GROUP A

| *First Semester* | *Second Semester* |
|---|---|
| Bot. 1a, General Botany, 3 | Bot. 2, Structural Botany, 3 |
| *Rhet. 1a, Rhetoric, 3 | Rhet. 2, Rhetoric, 3 |
| Mil. Sci. 1, Military Drill | Chem. 4, General Chemistry and Qualitative Analysis, 3 |
| †Freshman Lectures | Mil. Sci. 2, Military Drill |
| ‡Hygiene | |

GROUP B

Agr. Eng. 1a,b, Higher Algebra, 3. Required of those who do not present Higher Algebra for admission.

Agr. Eng. 3a,b, Plane Trigonometry, 3. Open to those who have com-

* Special attention is called to rules on delayed credit on page 48.

† A course of lectures intended primarily to familiarize the new student with the college, college customs and methods of procedure is required of all freshmen.

‡ All freshmen of the University are required to take a no credit course of twelve lectures in hygiene.

pleted Course 1 or those who present Higher Algebra for admission. This course must be taken the first year.

Chem. 3a,b, Advanced General Chemistry and Qualitative Analysis, 3 or Chem. 33, General Chemistry and Qualitative Analysis, 5. The five credit course is offered the first semester only and must be taken by those who do not present a unit of chemistry for admission. Students may be required to change from 3 to 33 at any time during the course. Those presenting a unit of high school chemistry can obtain not more than three credits for the completion of course 33.

Econ. 1b, Industrial History since 1750, 3, or Econ. 2a, Industries and Commerce of U. S., 3. One of these courses must be taken during the first year.

Hort. 90, General Horticulture, 3 or Horticulture Elective, 3. Horticulture Elective may be taken if additional Horticulture is registered for later in the course. Those intending to specialize in horticulture should register for a horticulture elective.

Dy. and An. Husb., 1a,b, Breeds and Types of Live Stock, 3

Dy. and An. Husb., 26a,b, Elements of Dairy Husbandry, 3

Agron. 1a,b, Farm Crops I, 3

Agr. Eng. 3a,b, Mechanical Drawing, 3. Open only to freshmen intending to pursue the course in Agricultural Education—Manual Training.

## SPECIAL REQUIREMENTS IN THE DIFFERENT COURSES OF STUDY

### COURSE IN AGRICULTURAL CHEMISTRY

Graduate Work Advised

#### SOPHOMORE YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | *Path. 58b, Bacteriology, 3 |
| Rhet. 11, Argumentation, 3 | Rhet. 12, Argumentation, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Chem. 35, Organic Chemistry, 4 | Chem. 36, Organic Chemistry, 4 |
| †Elective, 5 | Elective, 5 |
| Mil. Sci. 3, Military Drill | Mil. Sci. 4, Military Drill |

#### JUNIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Agr. Chem. 101, Quantitative Analysis, 5 | Agr. Chem. 102, Agricultural Quantitative Analysis, 5 |
| Phys. 1, General Physics, 3 | Phys. 2, General, 3 |
| Phys. 3, General Laboratory Practice, 1 | Phys. 4, General Laboratory Practice, 1 |
| Pl. Path. and Bot. 1, Plant Pathology, 3 | Soils 4, Soil Fertility, 3 |
| Soils 3, Soil Physics and Management, 3 | Elective, 6 |
| Elective, 3 | |

#### SENIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Chem. 121, Physical, 2 | Chem. 122, Physical, 2 |
| Chem. 123, Physico-Chemical Laboratory, 1 | Chem. 124, Physico-Chemical Laboratory, 1 |
| Agr. Chem. 111, Biochemistry, 3 | |

Agr. Chem. 113, Biochemical Laboratory, 2
Electives, 10
Public Health Lectures

Soils 108, Chemical Analysis of Soils, 3
Electives, 12

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

## COURSE IN AGRICULTURAL ECONOMICS

### Graduate Work Advised

### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Phys. 5, General Physics, 3
or
Elective, 3
Agr. Eng. 3a, Mechanical Drawing, 3
†Elective, 3
Mil. Sci. 3, Military Drill

*Second Semester*

*Path. 58b, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Agr. Chem. 4, Plant and Animal Life, 3
Phys. 6, General Physics, 3
or
Elective, 3
Econ. 18, Problems in Agricultural Economics, 3
Mil. Sci. 4, Military Drill

### JUNIOR YEAR

*First Semester*

Agron. 5, Farm Crops II, 3
Econ. 19, Marketing of Farm Products, 3
Econ. Zool. 3, Economic Entomology, 3
Dy. and An. Husb. 15, Principles of Nutrition, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3

*Second Semester*

Dy. and An. Husb. 16, Dairy Stock Feeding and Management, 3
Agr. Eng. 10, Farm Engineering, 3
Soils 4, Soil Fertility, 3
Agron. 101b, Farm Management I, 3
Econ. Elective, 6

### SENIOR YEAR

*First Semester*

Dy. and An. Husb. 7, Feeding Market Stock, 3
Econ. Electives, 6
Electives, 9
Public Health Lectures

*Second Semester*

Agron. 102b, Farm Management II, 3
Agron. Elective, 3
Econ. Elective, 3
Farm Mgt. Elective, 3
Electives, 6

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

## COURSE IN AGRICULTURAL EDUCATION

### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Phys. 5, General Physics, 3
or
Rhet. 21, Public Speaking, 3

*Second Semester*

*Path. 58, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Agr. Educ. 11b, Principles of Industrial Education, 3
Agr. Chem. 4, Plant and Animal Life, 3

Agr. Educ. 21, Industrial Education, 3
Dy. and An. Husb. 3, Market Classes, 3
Mil. Sci. 3, Military Drill

Phys. 6, General Physics, 3
or
†Agr. Eng. 3b, Mechanical Drawing, 3
Mil. Sci. 4, Military Drill

Students desiring to procure a state professional certificate should consult Chief of Division before registering for the sophomore year.

## JUNIOR YEAR

*First Semester*

Econ. Zool. 3, Economic Entomology, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Agron. 3, Farm Machinery, 3
Agron. 5, Farm Crops II, 3
Dy. and An. Husb. 15, Principles of Nutrition, 3

*Second Semester*

Agron. 104, Grain and Corn Judging, 3
Vet. Sci. 6, Veterinary Medicine, 3
Dy. and An. Husb. 16, Dairy Stock Feeding and Management, 3
Soils 4, Soil Fertility, 3
Dy. and An. Husb. 4, Stock Judging, 1
and
Dy. and An. Husb. 18, Dairy Stock Judging, 2
or
‡Agr. Educ. 131b, Methods, 3
**Agr. Educ. 68 and Hort. 94, Home and School Gardening, 3
or
**Econ. Zool. 16 and Pl. Path. and Bot. 6, Plant Pest Control, 3

## SENIOR YEAR

*First Semester*

Agr. Eng. 7, Farm Structures, 3
Dy. and An. Husb. 11, Poultry, 3
Pl. Path. and Bot. 9, Weeds and Seed Testing, 3
Agr. Educ. 151a, Organization and Management, 3
or
Agr. Educ. 141a, Teaching, 3
Dy. and An. Husb. 7, Feeding Market Stock, 3
††Agr. Educ. 131a, Methods, 3
or
Elective, 3
Public Health Lectures

*Second Semester*

Agron. 102b, Farm Management II, 3
**Econ. Zool. 16 and Pl. Path. and Bot. 6, Plant Pest Control, 3
or
**Agr. Educ. 68 and Hort. 94, Home and School Gardening, 3
Agr. Educ. 151b, Organization and Management, 3
or
Agr. Educ. 141b, Teaching, 3
‡‡Dy. and An. Husb. 4, Stock Judging, 1 and
‡‡Dy. and An. Husb. 18, Dairy Stock Judging, 2 and
Electives, 6
or
§Electives, 9

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Students omitting this course in the sophomore year will be required to register for it in place of an elective before the first semester of the senior year.

‡ By permission of Chief of Division a limited number may take Agr. Educ. 131b, Methods, to prepare for Course 141a, first semester, senior year. Those who do will take Dy. and An. Husb. 4 and 18 the second semester, senior year.

§ Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

** Both juniors and seniors should register for Plant Pest Control in 1916-17. The course will not be offered in 1917-18. Seniors graduating in June, 1917, must elect Home and School Gardening in addition to the Plant Pest Control.

†† For all those who did not take Methods in the junior year.

‡‡ Except for those who have taken these courses.

## COURSE IN AGRICULTURAL EDUCATION—MANUAL TRAINING

### SOPHOMORE YEAR

*First Semester*

Agr. Eng. 5, Carpentry, 3
Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Phys. 5, General Physics, 3
or
*Agr. Educ. 21, Industrial Education, 3
Dy. and An. Husb. 3, Market Classes, 3
Mil. Sci. 3, Military Drill

*Second Semester*

†Path. 58, Bacteriology, 3
Agr. Eng. 4, Blacksmithing, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Agr. Chem. 4, Plant and Animal Life, 3
Phys. 6, General Physics, 3
or
*Agr. Educ. 11b, Principles of Industrial Education, 3
Mil. Sci. 4, Military Drill

Students desiring to procure a state professional certificate should consult Chief of Division before registering for the sophomore year.

### JUNIOR YEAR

*First Semester*

‡Manual Training, 3
Econ. Zool. 3, Economic Entomology, 3
Soils 3, Soil Physics and Management, 3
Dy. and An. Husb. 15, Principles of Nutrition, 3
Agron. 3, Farm Machinery, 3
Agron. 5, Farm Crops II, 3

*Second Semester*

‡Manual Training, 3
Soils 4, Soil Fertility, 3
Dy. and An. Husb. 16, Dairy Stock Feeding and Management, 3
Dy. and An. Husb. 4, Stock Judging, 1
and
Dy. and An. Husb. 18, Dairy Stock Judging, 2
or
**Agr. Educ. 131b, Methods, 3
Agron. 104, Grain and Corn Judging, 3
††Agr. Educ. 68 and Hort. 94, Home and School Gardening, 3
or
††Econ. Zool. 16 and Pl. Path. and Bot. 6, Plant Pest Control, 3

### SENIOR YEAR

*First Semester*

‡Manual Training, 3
Agr. Eng. 7, Farm Structures, 3
Agr. Educ. 133, Methods and Administration of Manual Training, 3

*Second Semester*

‡Manual Training, 3
Agron. 102b, Farm Management II, 3
††Econ. Zool. 16 and Pl. Path. and Bot. 6, Plant Pest Control, 3

Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

* Those failing to present high school physics for entrance must register for the physics and may temporarily omit this course. It must be taken, however, before graduation.

† In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

‡ Courses in manual training will be offered to prepare for teaching and supervising this work in the primary grades, elementary grades and the high school; also for designing, construction, and repair work needed in the community and not provided for in other courses.

§ For all those who did not take Methods in the junior year.

** By permission of Chief of Division a limited number may take Agr. Educ. 131b, Methods, to prepare for Course 141a, first semester, senior year. Those who do will take Dy. and An. Husb. 4 and 18 the second semester, senior year.

†† Both juniors and seniors should register for Plant Pest Control in 1916-17. The course will not be offered in 1917-18.

Agr. Educ. 151a, Organization and Management, 3
§Agr. Educ. 131a, Methods, 3
or
Elective, 3
Dy. and An. Husb. 7, Feeding Market Stock, 3
Public Health Lectures
or
Agr. Educ. 68 and Hort. 94, Home and School Gardening, 3
Agr. Eng. 16, Farm Power Machinery, 3
Agr. Educ. 144, Observation and Teaching of Manual Training, 3
‡‡Dy. and An. Husb. 4, Stock Judging, 1
and
‡‡Dy. and An. Husb. 18, Dairy Stock Judging, 2
or
Agr. Educ. 151b, Organization and Management, 3

‡‡ Except for those who have taken these courses.

## COURSE IN AGRONOMY AND FARM MANAGEMENT

### Graduate Work Advised for Plant Breeding Specialists

#### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Eng. 3a, Mechanical Drawing, 3
Phys. 5, General Physics, 3
or
†Elective, 3
Bot. Elective, 3
Mil. Sci. 3, Military Drill

*Second Semester*

*Path. 58, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Bot. Elective, 3
or
Econ. 18, Problems in Agricultural Economics (For Farm. Mgt. students), 3
Agr. Chem. 4, Plant and Animal Life, 3
Phys. 6, General Physics, 3
or
Elective, 3
Mil. Sci. 4, Military Drill

#### JUNIOR YEAR

*First Semester*

Agron. 5, Farm Crops II, 3
Econ. Zool. 3, Economic Entomology, 3
Dy. and An. Husb. 15, Principles of Nutrition, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Elective, 3

*Second Semester*

Agron. 101b, Farm Management I, 3
Dy. and An. Husb. 16, Dairy Stock Feeding and Management, 3
Vet. Sci. 6, Veterinary Medicine, 3
Agr. Eng. 10, Farm Engineering, 3
Soils 4, Soil Fertility, 3
Elective, 3

#### SENIOR YEAR

*First Semester*

Agron. 102a, Farm Management II, 3
Agron. 103, Principles of Genetics, 3
or
Elective (for Farm Mgt. students), 3
Agr. Eng. 7, Farm Structures, 3

*Second Semester*

Agron. 108, Farm Management III, 3
Agron. 104, Grain and Corn Judging, 3
Agron. 106, Plant Breeding, 3
or

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

Pl. Path. and Bot. 9, Weeds and Seed Testing, 3
Dy. and An. Husb. 7, Feeding Market Stock, 3
Elective, 3
Public Health Lectures
Econ. Elective (for Farm Mgt. students), 3
Agron. or Farm Mgt. Elective, 3
Electives, 6

## COURSE IN DAIRY AND ANIMAL HUSBANDRY

### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Phys. 5, General Physics, 3
or
Elective, 3
Agr. Chem. 3a, Types of Carbon Compounds, 3
‡Elective, 3
Mil. Sci. 3, Military Drill

*Second Semester*

*Path. 58, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Agr. Eng. 3b, Mechanical Drawing, 3
Phys. 6, General Physics, 3
or
Elective, 3
Vet. Sci. 24, The Animal Body, 3
Mil. Sci. 4, Military Drill

### JUNIOR YEAR

*First Semester*

Dy. and An. Husb. 15, Principles of Nutrition, 3
An. Biol. 15, General Physiology, 3
Dy. and An. Husb. 3, Market Classes of Live Stock, 3
Soils 3, Soil Physics and Management, 3
Agron. Elective, 3
Elective, 3

*Second Semester*

Dy. and An. Husb. 18, Dairy Stock Judging, 2
An. Biol. 16, General Physiology, 3
Dy. and An. Husb. 16, Dairy Stock Feeding and Management, 3
Soils 4, Soil Fertility, 3
Dy. and An Husb. 4, Stock Judging, 1
†Vet. Sci. 12, Common Diseases, 3
Elective, 3

### SENIOR YEAR

*First Semester*

Dy. and An. Husb. 11, Poultry, 3
Dy. and An. Husb. 7, Feeding Market Stock, 3
Dy. and An. Husb. 9, Meats, 3
Vet. Sci. 5, Animal Breeding, 3
Agr. Eng. 7, Farm Structures, 3
Electives, 3
Public Health Lectures

*Second Semester*

Agron. 102b, Farm Management II, 3
Agron. Elective, 3
Dy. and An. Husb. Elective, 6
Elective, 6

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† If desired, this may be postponed until the senior year.

‡ Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

## COURSE IN ENTOMOLOGY AND ECONOMIC ZOOLOGY

Graduate Work Advised

### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3

*Second Semester*

*Path. 58, Bacteriology, 3

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Eng. 3a, Mechanical Drawing, 3
Phys. 5, General Physics, 3
or
†Elective, 3
Bot. or Econ. Zool. Elective, 3
Mil. Sci. 3, Military Drill

Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Bot. or Econ. Zool. Elective, 3
Agr. Chem. 4, Plant and Animal Life, 3
Phys. 6, General Physics, 3
or
Elective, 3
Mil. Sci. 4, Military Drill

## JUNIOR YEAR

*First Semester*

Econ. Zool. 3, Economic Entomology, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Hort. Elective, 3
Agron. Elective, 3
Elective, 3

*Second Semester*

Vet. Sci. 6, Veterinary Medicine, 3
Agr. Eng. 10, Farm Engineering, 3
Soils 4, Soil Fertility, 3
Econ. Zool. Elective, 3
Elective, 6

## SENIOR YEAR

*First Semester*

Chem. 35, Organic Chemistry, 4
Pl. Path. and Bot. 103, Bacterial Diseases, 3
Econ. Zool. Elective, 3
Econ. Zool. or An. Biol. Elective, 3
Electives, 5
Public Health Lectures

*Second Semester*

Chem. 36, Organic Chemistry, 4
Pl. Path. and Bot. 104, Principles of Pathology, 3
Pl. Path. and Bot. 14, Plant Disease Control, 3
Econ. Zool. Elective, 3
Econ. Zool. or An. Biol. Elective, 3
Electives, 2

† Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

## COURSE IN HORTICULTURE

Students majoring in Horticulture are required (1) to complete the following courses: 4, 5, 32 and 71; (2) to elect three from the following list of courses, 19, 21, 50, 54, and 56, 101, 107. General electives should include work in botany, plant pathology, meteorology, economic zoology, or economics. Students should consult with some member of the division staff in regard to the selection of electives.

## SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
†Agr. Eng. 3a, Mechanical Drawing, 3
Phys. 5, General Physics, 3
or
**Elective, 3
Bot. Elective, 3
Mil. Sci. 3, Military Drill

*Second Semester*

*Path. 58, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Agr. Chem. 4, Plant and Animal Life, 3
Phys. 6, General Physics, 3
or
‡Elective, 3
Bot. Elective, 3
Mil. Sci. 4, Military Drill

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Students presenting mechanical drawing (one unit) for entrance may take a horticultural elective.

‡ Horticulture elective or meteorology advised.

** Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

### JUNIOR YEAR

*First Semester*

Econ. Zool. 3, Economic Entomology, 3
For. 21, Farm Forestry, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Hort. Elective, 3
Elective, 3

*Second Semester*

Econ. Zool. 18, Control of Insect Pests, 3
Pl. Path. and Bot. 14, Plant Disease Control, 3
Soils 4, Soil Fertility, 3
Hort. Elective, 3
Elective, 6

### SENIOR YEAR

*First Semester*

Agron. 103, Principles of Genetics. 3
Hort. Electives, 9
Elective, 6
Public Health Lectures

*Second Semester*

Agron. 106, Plant Breeding, 3
Vet. Sci. 6, Veterinary Medicine, 3
or
Elective, 3
Hort. Elective, 9
Elective, 3

## COURSE IN PLANT PATHOLOGY

Graduate Work Advised

### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Chem. 3a, Types of Carbon Compounds, 3
Bot. Elective, 3
**Elective, 3
Mil. Sci. 3, Military Drill

*Second Semester*

*Path. 58, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Agr. Chem. 2b, Quantitative Methods, 3
Bot. Elective, 3
Elective, 3
Mil. Sci. 4, Military Drill

### JUNIOR YEAR

*First Semester*

†Phys. 1, General Physics, 3
Econ. Zool. 3, Economic Entomology, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Bot. Elective, 3
Elective, 3

*Second Semester*

‡Phys. 2, General Physics, 3
Soils 4, Soil Fertility, 3
Bot. Elective, 6
Electives, 6

### SENIOR YEAR

*First Semester*

Pl. Path. and Bot. 103, Bacterial Diseases, 3
Agr. Chem. 111, Biochemistry, 3
Agron. 103, Principles of Genetics, 3
Bot. or Econ. Zool. Elective, 3
Elective, 6
Public Health Lectures

*Second Semester*

Pl. Path. and Bot. 104, Principles of Pathology, 3
Pl. Path. and Bot. 14, Plant Disease Control, 3
Econ. Zool. 18, Control of Insect Pests, 3
Bot. or Econ. Zool. Elective, 3
Hort. Elective, 3
Elective, 3

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Phys. 3, General Laboratory Practice 1, should be taken at the same time.

‡ Phys. 4, General Laboratory Practice 1, should be taken at the same time.

** Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

## COURSE IN SOILS

Graduate Work Advised

### SOPHOMORE YEAR

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
Chem. 11, Quantitative Analysis, 4
Geol. 1, General, 3
†Elective, 2
Mil. Sci. 3, Military Drill

*Second Semester*

*Path. 58, Bacteriology, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Chem. 12, Quantitative Analysis, 4
Agr. Eng. 3b, Mechanical Drawing, 3
Elective, 2
Mil. Sci. 4, Military Drill

### JUNIOR YEAR

*First Semester*

Agr. Chem. 3, Types of Carbon Compounds, 3
Phys. 1, General Physics, 3
Phys. 3, General Laboratory Practice, 1
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Soils 107a, Mechanical Analysis of Soils, 2
Elective, 3

*Second Semester*

Soils 108, Chemical Analysis of Soils, 3
Phys. 2, General Physics, 3
Physics 4, General Laboratory Practice, 1
Agr. Eng. 10, Farm Engineering, 3
Soils 4, Soil Fertility, 3
Elective, 5

### SENIOR YEAR

*First Semester*

Agr. Chem. 111, Biochemistry, 3
Geol. 21, Elements of Mineralogy, 3
Econ. Zool. 3, Economic Entomology, 3
Electives, 9
Public Health Lectures

*Second Semester*

Soils 102, Soil Chemistry, 5
Agron. 102b, Farm Management II, 3
Electives, 10

* In case this course is not available an elective (3 credits) may be substituted in 1916-1917.

† Pol. Sci. 1a,b, American Government, 3 must be elected at some time during the course.

## ELECTIVES

The following electives are suggested, but students are not confined to these courses. Every student at some time during his course must elect Pol. Sci. 1a or 1b, American Government. A student may also select as electives, courses required in curricula other than that in which he is specializing.

These electives are open as indicated below subject to the satisfaction of the prerequisites for which see the departmental statement in each case.

### FRESHMAN YEAR

*First Semester*

Agr. Eng. 5, Carpentry, 3
Agr. Eng. 17, Advanced Blacksmithing, 3
Dy. and An. Husb. 11, Poultry, 3
Econ. 1a, Industrial History since 1750, 3
Econ. 2a, Industries and Commerce of U. S., 3
German, (See dept. statement)
Romance Languages, (See dept. statement)
Scandinavian, (See dept. statement)

*Second Semester*

Agr. Eng. 4, Blacksmithing, 3
Dy. and An. Husb. 30, Incubating and Brooding, 2
Econ. 1b, Industrial History since 1750, 3
Econ. 2b, Industries and Commerce of U. S., 3
German (See dept. statement)
Romance Languages, (See dept. statement)
Scandinavian, (See dept. statement)
H. E. 24, Camp Cookery, 1

## SOPHOMORE YEAR

*First Semester*

Agr. Chem. 2a, Quantitative Methods, 3
Dy. and An. Husb. 3, Market Classes of Live Stock, 3
Hort. 71, Landscape Gardening, 3
Hort. 73, Nursery Practice, 1½
Pl. Path. and Bot. 7, Weeds and Grasses, 3
Pl. Path. and Bot. 9, Weeds and Seed Testing, 3
Rhet. 13a, Advanced Argumentation, 3
Rhet. 21, Public Speaking, 3
Vet. Sci. 25, The Animal Body, 3
An. Biol. 7, Histology and Embryology, 3
An. Biol. 15, General Physiology, 3
An. Biol. 19, Comparative Gross Anatomy of Vertebrates, 3
An. Biol. 23, Entomology, 3
Bot. 5, Plant Morphology, 3
Bot. 7, Taxonomy, 3
Bot. 9, Physiology and Ecology, 3
Bot. 11, Industrial Botany, 3
Bot. 13, Mycology, 3
Chem. 35, Organic Chemistry, 4
Econ. 4a, Economic Problems, 3
Econ. 13, Economic Geography of Foreign Countries, 3
Jour. 3, News Writing, 3
Jour. 11, Agricultural Journalism, 3
Econ. 35, Accounting Principles, 3
Econ. 43a, Banking, 3
Eng. 1, General Survey of English Literature, 3
Eng. 5a, Chaucer, 3
Geol. 1, General Geology, 3
Geol. 3, Laboratory, 1
Geol. 5, Economic Geology, 3
Geol. 21, Elements of Mineralogy, 3
Geol. 29, General Physiography, 3
Geol. 35, Laboratory, 1
Phil. 1, General Psychology, 3
Phil. 5a, Elements of Psychology, 3
Phil. 9a, Logic, 3
Phys. Ed. 3, Intermediate Physical Training, 1½
*Pol. Sci. 1a, American Government, 3
Pol. Sci. 5, European Municipal Administration, 3
Pol. Sci. 7a, State and Local Government, 3

*Second Semester*

Ag. Chem. 2b, Quantitative Methods, 3
Dy. and An. Husb. 4, Stock Judging, 1
Hort. 32, Market Gardening, 3
Hort. 50, Floriculture, 3
Hort. 56, Plant Propagation, 1
Rhet. 13b, Advanced Argumentation, 3
Rhet. 22, Public Speaking, 3
Vet. Sci. 24, The Animal Body, 3
An. Biol. 8, Histology and Embryology, 3
An. Biol. 16, General Physiology, 3
An. Biol. 20, Comparative Gross Anatomy of Vertebrates, 3
An. Biol. 24, Entomology, 3
An. Biol. 28, Ornithology, 3
Bot. 6, Plant Morphology, 3
Bot. 8, Taxonomy, 3
Bot. 10, Physiology and Ecology, 3
Bot 12, Industrial Botany, 3
Bot. 14, Mycology, 3
Chem. 36, Organic Chemistry, 4
Econ. 4b, Economic Problems, 3
Econ. 34, Business Management, 3
Jour. 12, Agricultural Journalism, 3
Econ. 36, Accounting Principles, 3
Econ. 43b, Banking, 3
Econ. 46, Property Insurance, 3
Eng. 2, General Survey of English Literature, 3
Eng. 5b, Chaucer, 3
Eng. 6, Spenser, 3
Geol. 2, Geology, 3
Geol. 4, Geology of Minnesota, 3
Geol. 34, Meteorology, 3
Phil. 2, General Psychology, 3
Phil. 5b, Elements of Psychology, 3
Phil. 9b, Logic, 3
Phys. Ed. 4, Intermediate Physical Training, 1½
*Pol. Sci. 1b, American Government, 3
Pol. Sci. 6, American Municipal Administration, 3
Pol. Sci. 7b, State and Local Government, 3

Electives for the junior and senior years will be found under Description of Courses.

* Every student must complete this course before graduation.

# DESCRIPTION OF COURSES

For explanation of course numbers and credits see page 20.

## AGRICULTURAL CHEMISTRY

Professor ROSCOE W. THATCHER; Associate Professor ROSS AIKEN GORTNER; Assistant Professors CLYDE H. BAILEY*, JOHN J. WILLAMAN; Instructor CORNELIA KENNEDY; Assistant EVERETT H. DOHERTY.

*General statement.*—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 Chemistry. For specialization in this Division, see special requirements in Course of Study.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 2a,b. | Quantitative Methods | 3 | Soph., jr. | Chem. 1 yr. |
| 3a,b. | Types of Carbon Compounds | 3 | Soph., jr. | Chem. 1 yr. |
| 4. | Chem. of Plant and An. Life | 3 | Soph. | Chem. 1 yr. |
| 6. | Dairy Chemistry | 3 | Jr, sr. | 2 |
| | *Advanced Courses* | | | |
| 101. | Quantitative Analysis | 5 | Jr., sr. | Chem. 2 yrs. |
| 102. | Agr. Quant. Analysis | 5 | Jr., sr. | 101 |
| 105. | Detection of Adulteration | 5 | Sr. | 102 |
| 106. | Agr. Products and By-Products | 3 | Sr | 102 |
| 108. | Chem. of Wheat and Its Products | 2 | Sr. | 3 |
| 110. | Flour Laboratory Methods | 3 | Sr. | 102; parallel 108 |
| 111. | Biochemistry | 3 | Sr. | Biol. 2 yrs., Org Chem. |
| 113. | Biochemical Lab. Methods | 2 | Sr. | 102, Biol. 2 yrs., Org. Chem. |
| 116. | Colloids | 3 | Sr. | 111 |
| 118. | Enzymes | 3 | Sr. | 111 |

* Absent on leave 1916-17.

### INTRODUCTORY COURSES

2a,b. QUANTITATIVE METHODS. A brief course in the principles of quantitative analysis, including a study of stoichiometric problems practice in the use of the balance and in a few of the simpler gravimetric and volumetric processes. WILLAMAN.

3a,b. TYPES OF CARBON COMPOUNDS. An elementary study of the different groups of carbon compounds, with special reference to their relationships and their occurrence in plant and animal materials used as food. THATCHER.

4. THE CHEMISTRY OF PLANT AND ANIMAL LIFE. The organic compounds

commonly found in plant and animal tissues. The chemical changes during growth, harvesting, storage, and preparation for market. Factors affecting composition and changes therein. Utilization of farm by-products. WILLAMAN.

6. DAIRY CHEMISTRY. The chemistry of milk and its products. Laboratory work in the quantitative analysis of milk, butter, and cheese, and the detection of adulterants in those products. WILLAMAN.

## ADVANCED COURSES

101. QUANTITATIVE ANALYSIS. The principles involved in gravimetric and volumetric analyses. The course includes the gravimetric determination of iron, sulphur, phosphorus, magnesium, and chlorine; acidimetry, alkalimetry; the volumetric determination of iron and calcium; and iodimetry WILLAMAN.

102. AGRICULTURAL QUANTITATIVE ANALYSIS. Methods of proximate analysis of agricultural products, including the determination of moisture, ash, fats, starch, sugars, fiber, proteins, and the different nitrogenous constituents of foods and feeding stuffs. WILLAMAN.

105. DETECTION OF ADULTERANTS OF FOODS AND FEEDING STUFFS. The use of proximate analyses and special tests for the determination of quality and the detection of adulteration of foods and feeds. Includes chemical and microscopical examinations. THATCHER, KENNEDY.

106. AGRICULTURAL PRODUCTS AND BY-PRODUCTS. The composition of the principal products and by-products of agriculture and their utilization as raw material in various industries, and the methods of chemical control work in these industries. BAILEY.

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. BAILEY.

110. FLOUR LABORATORY METHODS. A laboratory course in the methods of analyses of wheat and its products; milling tests of wheat; and baking and special tests of flour. BAILEY.

111. BIOCHEMISTRY. An advanced course in the chemistry of fats, carbohydrates, tannins, proteins, enzymes, and colloids and their relation to the vital processes involved in plant and animal growth and nutrition. THATCHER.

113. BIOCHEMICAL LABORATORY METHODS. Special methods of examination of plant and animal tissues for particular fats, carbohydrates, proteins, and enzymes. KENNEDY.

116. COLLOIDS. An advanced study of colloidal systems, of the preparation and properties of colloidal solutions, and the relations of these

to biochemical processes. (Offered in alternate years, not offered in 1916-17). GORTNER.

118. ENZYMES. An advanced study of the nature of enzyme action including methods of preparation and investigation of enzymes, their physical and chemical properties and their method of action. (Offered in alternate years, offered in 1916-17.) THATCHER.

## AGRICULTURAL ECONOMICS

See Department of Economics (page 56).

## AGRICULTURAL EDUCATION

Professors ASHLEY V. STORM, DEXTER D. MAYNE; Associate Professor WILBUR H. BENDER; Assistant Professor WILLIAM F. LUSK; Extension Specialists THEODORE A. ERICKSON, GEORGE F. HOWARD.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| *11a,b. | Principles of Industrial Education | 3 | All | None |
| *21. | Industrial Education | 3 | All | None |
| 63. | General Agriculture | 3 | All | None |
| 64. | General Agriculture | 3 | All | None |
| 68. | Home and School Gardening | 3 | Jr., sr. | Hort. 90 |
| | *Advanced Courses* | | | |
| *131a,b. | Methods in Teaching High School Agriculture | 3 | Sr. | 11 |
| *141a,b. | Teaching | 3 | Sr. | 131 |
| *151a,b. | Organization and Management | 3 | Sr. | None |
| 161. | Fundamentals of Agriculture | 3 | All | None |
| 162. | Fundamentals of Agriculture | 3 | All | None |
| 171. | Extension Work | 3 | Sr. | None |

* College of Education.

### INTRODUCTORY COURSES

11a,b. PRINCIPLES OF INDUSTRIAL EDUCATION. A study of the fundamental principles upon which education is based. Throughout the course emphasis is placed on those phases which are most closely related to industrial education. LUSK.

21. INDUSTRIAL EDUCATION. A short history of industrial education; the present status in Europe and United States; manual training and home arts in an educational system; the place of agriculture in the public schools; trade and vocational schools. MAYNE.

### ADVANCED COURSES

63. GENERAL AGRICULTURE. For students specializing in such divisions as

Agricultural Chemistry, Economic Entomology, Plant Pathology, and in other colleges. The course will consist of a series of units by division chiefs and other agricultural specialists. STORM, MAYNE.

64. GENERAL AGRICULTURE. Continuation of Course 63. Credit is given for either course separately but there is no duplication of subject matter and both should be taken to obtain a general knowledge of agriculture. STORM, MAYNE.

68. HOME AND SCHOOL GARDENING. Lectures and laboratory. A consideration of the elements of horticulture as applied to high-school instruction, plant propagation, fruit growing, home gardening, school gardening, and the planning of home and school grounds. Same as Hort. 94. LUSK, BRIERLEY.

131a,b. METHODS IN TEACHING HIGH-SCHOOL AGRICULTURE. Fundamental elements of method in teaching as related to teaching agriculture in high school. Organizing subject matter of daily work; selection and manipulation of devices. Classroom and laboratory method. Specific plans for teaching secondary agriculture. BENDER.

141a,b. TEACHING. Observation of regular classes; interpretation of class practices; 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's teaching. STORM, BENDER, LUSK.

151a,b. ORGANIZATION AND MANAGEMENT. Organization and management of work in secondary schools, particularly of Minnesota, with special reference to agricultural work, courses of study, programs, equipment, laboratory and class management, extension work, plots, and coördination of work. STORM.

161. FUNDAMENTALS OF AGRICULTURE. Essential for principals and superintendents of schools in which agriculture is taught, and valuable for students of other colleges whose time for agriculture is limited. Agricultural College Experts will give work in their special fields. BENDER.

162. FUNDAMENTALS OF AGRICULTURE. Continuation of Course 161. Credit is given for either course separately, but there is no duplication of subject matter and both should be taken to obtain a fundamental knowledge of agriculture. LUSK.

171. 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 in Minnesota. STORM.

## AGRICULTURAL ENGINEERING

Professor JOHN T. STEWART; Assistant Professors JASON L. MOWRY, HARRY B. ROE; Instructors ALLEN D. JOHNSTON, HALL B. WHITE, LLOYD R. WHITSON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | ***Introductory Courses*** | | | |
| 1a,b. | Higher Algebra | 3 | Fr. | None |
| 2a,b. | Plane Trigonometry | 3 | Fr. | Higher Algebra |
| 3a,b. | Mechanical Drawing | 3 | Fr., soph. | None |
| 4. | Blacksmithing | 3 | All | None |
| 5. | Carpentry | 3 | All | None |
| 7. | Farm Structures | 3 | Sr. | 8 |
| 8. | Agricultural Physics | 3 | Jr. | 2, 3 |
| 9. | Household Mechanics | 3 | Sr. | 3 |
| 10. | Farm Engineering | 3 | Jr. | 2, 3 |
| 16. | Farm Power Machinery | 3 | Sr | 8 |
| 17. | Advanced Blacksmithing | 3 | All | 4 |
| 18. | Surveying | 3 | Sr. | 2, 3 |

INTRODUCTORY COURSES

1a,b. HIGHER ALGEBRA. Special attention is given to practical problems, the methods of computation and a foundation for Plane Trigonometry. ROE.

2a,b. PLANE TRIGONOMETRY. Theory and use of logarithms and a study of the functions of Plane Trigonometry with numerous practical applications. ROE.

3a,b. MECHANICAL DRAWING. Lectures on drawing, exercise in the use of drawing instruments, lettering, and water colors. The making of working drawings with their practical value. WHITSON.

4. BLACKSMITHING. Students are instructed in the management of forge and fire and in bending, shaping, and welding iron. JOHNSTON.

5. CARPENTRY. Instruction given in the use of common carpentry tools and the methods of farm building construction. WHITE.

7. FARM STRUCTURES. The planning, designing, and location of farm buildings, including specifications and estimates of cost. MOWRY.

8. AGRICULTURAL PHYSICS. The principles of physics as applied to agriculture including ventilation, heating, lighting, water supply, and electricity. MOWRY.

9. HOUSEHOLD MECHANICS. The general principles of heating, plumbing, ventilating, and lighting, and the planning of Home Economics labatories including floors, woodwork, and ventilating. MOWRY.

10. FARM ENGINEERING. The principles of land surveys, the improvement of farm lands by drainage, explosives and their use, and a brief summary of road construction in agricultural districts. STEWART.

16. FARM POWER MACHINERY. The subjects considered are: flexible connectors, pulleys, shafting, gear wheels, bearings, oils, lubrication, and engines. Special emphasis placed on laboratory work. MOWRY.

17. ADVANCED BLACKSMITHING. Students are instructed in bending, shaping, and welding steel and the tempering of steel tools. JOHNSTON.

18. SURVEYING. Theory and practice of plane surveying applied to farm management. Mensuration, leveling, and farm mapping. Not offered in 1916-17. STEWART.

## AGRONOMY AND FARM MANAGEMENT

Professors ANDREW BOSS, COATES P. BULL; Associate Professors ALBERT C. ARNY, HERBERT K. HAYES; Assistant Professors LOUIS B. BASSETT, ALVA H. BENTON, PETER J. OLSON, FRANCIS W. PECK; Extension Specialists GEORGE J. BAKER*, RAY L. DONOVAN, THOMAS B. MCCULLOUGH.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

COURSES

| No. | Credits | Title | Offered to | Prereq. Courses |
|---|---|---|---|---|
| | | *Introductory Courses* | | |
| 1a,b. | 3 | Farm Crops I | Fr. | None |
| 3. | 3 | Farm Machinery | Sr. | None |
| 5. | 3 | Farm Crops II | Jr. | 1, Bot. 1 yr. |
| | | *Advanced Courses* | | |
| 101b. | 3 | Farm Management I | Jr., sr. | 1, Econ. 3 |
| 102a,b. | 3 | Farm Management II | Sr. | 1, Econ. 3 |
| *103. | 3 | Principles of Genetics | Sr. | Dy. & An. Husb. 26, Bot. 1 yr. An. Biol. 1 yr. |
| 104. | 3 | Grain and Corn Judging | Jr., sr. | 1, Bot. 1 yr. |
| *106. | 3 | Plant Breeding | Sr. | 103 |
| 108. | 3 | Farm Management III | Sr. | 101, 102 |

* Open to any student of the University having the required prerequisites.

### INTRODUCTORY COURSES

1a,b. FARM CROPS I. An elementary study of the important field crops of the United States, with emphasis upon those of local importance; distribution, economic importance, agricultural classifications, cultural methods, and principles of improvement. OLSON.

3. FARM MACHINERY. Lectures, practical discussions and practice work in the best methods of adjustment, handling, and adapting various kinds of machinery to the soils, weeds, and seasons. BASSETT.

5. FARM CROPS II. A systematic study of the form and structure of the entire plants of the cereal, forage, fiber, and root crops adapted to the North Central states. ARNY.

### ADVANCED COURSES

101b. FARM MANAGEMENT I. Textbook and practice work in the art of record keeping, accounting, and kindred subjects. Designed especially for students expecting to become farm managers or farm-management field men. PECK.

* Absent on leave 1916-17.

102a,b. FARM MANAGEMENT II. A course in which the business side of farming is emphasized. Special attention is given to farm organization, equipment, and operation. BOSS.

103. PRINCIPLES OF GENETICS. A course of lectures and laboratory work designed to familiarize the student with the underlying principles of breeding. Heredity, variation, biometry, and evolution are emphasized. HAYES, DORSEY.

104. GRAIN AND CORN JUDGING. A study in detail of representative samples of the leading varieties of grains and corn and grass seeds, with score card practice in comparative judging of grain, corn, and grass seed. ARNY.

106. PLANT BREEDING. Applied genetics is emphasized. The method of breeding each of the important agricultural and horticultural crops is studied, with special attention to experiment station investigations and to the methods used by plant breeders. HAYES, VALLEAU.

108. FARM MANAGEMENT III. An advanced seminar course including a study of farm practices, farm equipment, cost of production, and efficiency of labor. BOSS, PECK.

## BEE CULTURE

Professor FRANCIS JAGER; Instructor LLOYD V. FRANCE.

*General statement.*—Theoretical and practical instruction on bees, honey, and wax production. At least one year of Botany should be completed before electing these courses. General Zoology and Economic Entomology are also desirable. If not already completed they should be taken at same time as the courses in Bee Culture.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 5-6. | Elements of Beekeeping | 6 | Jr., sr. | None |
| 8. | Advanced Beekeeping | 3 | Jr., sr. | 5 |

INTRODUCTORY COURSES

5-6. ELEMENTS OF BEEKEEPING. Elementary study of queens, drones, and workers, hives and appliances, handling of bees, spring, summer, winter management, swarming and increase, honey and wax production, feeding and bee diseases. JAGER, FRANCE.

8. ADVANCED BEEKEEPING. Anatomy of the bee, queen rearing, commercial production of honey, out apiaries, accounting and marketing. JAGER, FRANCE.

## DAIRY AND ANIMAL HUSBANDRY

Professors THEOPHILUS L. HAECKER, ARTHUR C. SMITH, ROBERT M. WASHBURN; Assistant Professors ROBERT C. ASHBY, GUSTAV W. GEH-

RAND, JOSEPH S. MONTGOMERY, THOMAS G. PATERSON; Instructors EDWIN O. HANSON, DWIGHT J. LANE; Extension Specialists NORTON E. CHAPMAN, ARTHUR J. MCGUIRE, WILLIAM A. MCKERROW.

*General statement.*—For specialization in this division, see special requirements in Course of Study.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Breeds and Types of Live Stock... | 3 | Fr., soph | None |
| 3. | Market Classes of Live Stock..... | 3 | Soph., jr. | 1 |
| 4. | Stock Judging ..... | 1 | Soph., jr. | 3 |
| 5. | Adv. Stock Judging..... | 3 | Sr. | 4 |
| 7. | Feeding Market Stock..... | 3 | Sr. | 16 |
| 9. | Meats ..... | 3 | Sr. | 4, 15 |
| 11. | Poultry ..... | 3 | All | None |
| 14. | Elements of Animal Nutrition..... | 3 | Sr. | 15 |
| 15. | Principles of Nutrition..... | 3 | Jr | 26 |
| 16. | Dy. Stock Feeding and Mgt..... | 3 | Jr | 15 |
| 18. | Dairy Stock Judging..... | 2 | Jr. | 26 |
| 19. | Factory Management ..... | 3 | Jr., sr. | 26 |
| 20. | Factory Butter-making ..... | 3 | Jr., sr. | 26 |
| 22. | Beef Cattle Breeding..... | 2 | Sr. | 4, 7, Vet. Sci. 5 |
| 24. | Sheep Husbandry ..... | 2 | Sr. | 4, 7, Vet. Sci. 5 |
| 26a,b. | Elements of Dairy Husbandry.... | 3 | Fr. | None |
| 28. | Swine Husbandry ..... | 2 | Sr. | 4, 7, Vet. Sci. 5 |
| 30. | Incubating and Brooding..... | 2 | All | None |
| 32. | Horse Husbandry ..... | 2 | Sr. | 4, 7, Vet. Sci. 5 |
| 34. | Feeding Seminar ..... | 3 | Sr. | 7 |
| 36. | Adv. Dairy Husbandry ..... | 3 | Sr. | 16, 18 |
| *38. | Cheese-making ..... | 3 | Jr., sr. | None |
| *40. | Creamery Practice ..... | 3 | Jr., sr. | None |

* Summer work.

INTRODUCTORY COURSES

1a,b. BREEDS AND TYPES OF LIVE STOCK. A study of the types and breeds of beef cattle, swine, sheep, and horses with special reference to the origin and leading characteristics of each of the important breeds. PATERSON, MONTGOMERY, ASHBY.

3 MARKET CLASSES OF LIVE STOCK. Includes a discussion of the various market classes of cattle, sheep, and swine, and practice work in judging market classes during the term. PATERSON.

4. STOCK JUDGING. Practice in judging breeding classes of beef cattle, sheep, horses, and swine. Placings and reasons are submitted, followed by a general discussion with the instructor. MONTGOMERY, PATERSON, ASHBY.

5. ADVANCED STOCK JUDGING. Senior elective in Dairy and Animal Husbandry Course. MONTGOMERY.

7. FEEDING MARKET STOCK. Economical rations for growing and fattening all classes of market stock. Includes a discussion of shelter re-

quirements, feed racks, and the details of management applicable to conditions on the average farm. ASHBY.

9. MEATS. General course in the dressing of animals and the cutting of carcasses. Lectures and laboratory work. PATERSON.

11. POULTRY. A study of the poultry industry; best methods of care and management of fowls, turkeys, ducks, and geese, and the most important breeds of same. SMITH.

14. ELEMENTS OF ANIMAL NUTRITION. This includes a thoro study of experiments made on ingo and expenditure of matter and the income and expenditure of energy, the relation of food consumed to energy expended. Not offered in 1916-17.

15. PRINCIPLES OF NUTRITION. The principles of animal nutrition, their relation to the economic production of animal products, and the relation of the constituents in feed consumed to amount and character of products produced. HAECKER.

16. DAIRY STOCK FEEDING AND MANAGEMENT. Characteristics and nutritive values of fodders, feed stuffs, and forage crops. The general development, feeding, and management of dairy stock, with special stress on feeding. One dairy barn plan required. HAECKER, GEHRAND.

18. DAIRY STOCK JUDGING. Practice work in judging animals of the leading dairy breeds. Herds in the vicinity of the Twin Cities are visited. GEHRAND.

19. FACTORY MANAGEMENT. Organization of creamery associations, the construction and equipment of factories, with lectures on calculating dividends, sinking funds, locating financial leaks, and marketing. WASHBURN.

20. FACTORY BUTTER-MAKING. The separation of milk, preparation of pure culture starters, and cream ripening, controlling moisture content of butter, market requirements, scoring of butter, with laboratory practice in the college creamery. WASHBURN.

22. BEEF CATTLE BREEDING. The management of pure-bred herds of beef cattle, building equipment, food stuffs suitable, selection of foundation stock, methods of improvement, and marketing. Includes study of pedigrees, herd book registrations, and practicums. PATERSON.

24. SHEEP HUSBANDRY. The care and management of pure-bred sheep, study of pedigrees. registrations, fitting for show purposes, marketing, Practicums in feeding, shearing, blocking, and caring for young lambs. PATERSON.

26a,b. ELEMENTS OF DAIRY HUSBANDRY. Origin, characteristics, and adaptation of dairy breeds of cows; particular attention is given to feeding followed by a study of the chemical and physical constituents of milk. Practice in butter-making, and milk testing required. WASHBURN, GEHRAND.

28. SWINE HUSBANDRY. The business of pork production. Includes hous-

ing and equipment, formation of breeding herds, methods of feeding, management, marketing. Every student required to do actual practice work at the swine barns. ASHBY.

30. INCUBATING AND BROODING. Includes 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. SMITH, LAUE.

32. HORSE HUSBANDRY. The feeding, breeding, management, and marketing of horses. Practicums dealing with breaking colts, stable management, fitting for show purposes will be included. MONTGOMERY.

34. FEEDING SEMINAR. Consists of review of recent bulletins, dealing with the results of experiments in feeding beef cattle, sheep, swine, and horses as published by the various experiment stations. MONTGOMERY.

36. ADVANCED DAIRY HUSBANDRY. A critical survey of recent work in the field of animal development and milk production. A study of methods and evidence; the interpretation of results and methods of presentation of subject matter. Not offered in 1916-17.

38. CHEESE MAKING PRACTICE. A minimum experience of one month in an approved cheese factory is advised of all students specializing in Dairy Manufacture. WASHBURN.

40. CREAMERY PRACTICE. Experience in the factory is essential to knowledge or appreciation of the problems of dairy manufacturing. A minimum of four weeks' experience in an approved creamery is advised WASHBURN.

## ECONOMIC ZOOLOGY

Professor FREDERIC L. WASHBURN; Associate Professor ARTHUR G. RUGGLES; Assistant Professors CHARLES W. HOWARD, WILLIAM MOORE.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

Courses in this division are closely correlated with those offered by the Department of Animal Biology of the College of Science, Literature, and the Arts. For courses of that department see page 51.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3. | Economic Entomology ..... | 3 | Jr. | An. Biol. 3-4 |
| 4. | Economic Vertebrate Zoology... | 2 | Jr., sr | An. Biol. 3-4 |
| 5. | Forest Entomology ..... | 3 | Jr. | An. Biol. 3 4 |
| 9. | Animal Parasites ..... | 3 | Jr., sr. | An. Biol. 3-4 |
| 11. | Nursery Inspection ..... | 2 | Jr., sr. | *18, Hort. 73 |
| 12. | Forest Zoology ..... | 2 | Jr. | An. Biol. 3-4 |
| 14. | Insects and Public Health..... | 2 | Jr , sr. | An. Biol. 3-4 |
| 16. | Plant Pest Control ..... | 3 | Jr., sr | 3, Pl. Path. 1 |
| 18. | Control of Insect Pests..... | 3 | Jr., sr. | 3, Pl. Path. 14, Hort. 1 sem. |
| 20. | Home Economics Entomology... | 2 | Soph., jr., sr. | An. Biol 9-10 |

*Advanced Courses*

| | | | |
|---|---|---|---|
| 104. Methods in Econ. Ent. ..... | 3 | Jr., sr. | 3 |
| 105-106. Special Problems ..... | 6 | Jr., sr. | 104 |
| 107-108. Immature Stages of Insects..... | 3 or 6 | Jr., sr. | 3 |
| 109-110. Action of Insecticides..... | 3 or 6 | Jr., sr. | 3 |

* These may be taken parallel with course 11.

INTRODUCTORY COURSES

3. ECONOMIC ENTOMOLOGY. A consideration of the most important insect pests; methods of control; insecticides and insecticidal apparatus; beneficial insects. All students entering this course make a collection of insects. WASHBURN, RUGGLES, HOWARD, MOORE.

4. ECONOMIC VERTEBRATE ZOOLOGY. The relation of birds and four-footed wild animals to agriculture. Laboratory and field work. Identification of Minnesota birds affecting the horticulturist and agriculturist; also of vertebrate farm pests, study of habits, methods of combating. WASHBURN.

5. FOREST ENTOMOLOGY. A special study is made of insects affecting shade and forest trees and the best means of controlling them. RUGGLES.

9. ANIMAL PARASITES. A consideration of parasitism and the more common animal parasites of man and domestic animals. HOWARD, BOYD.

11. NURSERY INSPECTION. Practical work in inspection of nurseries and imported nursery stock. Study of different state laws; of quarantine rulings and reasons therefor; study of methods in field and office. WASHBURN.

12. FOREST ZOOLOGY. Forest animals. Relations of birds and of various four-footed animals to forest protection. Habits, range, usefulness; the manner of protecting the important large and small game, fish, birds; also a discussion of fish culture. WASHBURN.

14. INSECTS AND PUBLIC HEALTH. A consideration of the agency of insects and insect-like animals in the transmission of diseases; also methods of sanitation, etc., related to their control and disease transmission. HOWARD.

16. PLANT PEST CONTROL. Given jointly by the Division of Economic Zoology and the Division of Plant Pathology and Botany. Same as Pl. Path. and Bot. 6. The theory and practice of control of insect and fungous pests of crop plants. Practical applications. Not open to those who have completed course 18 or Pl. Path. and Bot. 14. Given in alternate years. Offered in 1916-17. RUGGLES, STAKMAN, BISBY.

18. CONTROL OF INSECT PESTS. The principal insects of the orchard and garden are studied in detail. The last part of the course deals with spray materials and their method of application. Not open to those who have completed course 16. Given in alternate years; not offered in 1916-17. RUGGLES, MOORE.

20. HOME ECONOMICS ENTOMOLOGY. A course designed for students in

Home Economics. Insects as related to public health problems, insects of the household and those attacking foods will be discussed. HOWARD.

### ADVANCED COURSES

104. METHODS IN ECONOMIC ENTOMOLOGY. Methods of breeding insects; identification of insects in various stages; photography of insects; general field work, etc. MOORE.

105-106. SPECIAL PROBLEMS. Special problems for those intending to specialize in entomology or economic zoology. Problems may be chosen in any section of the Division. Attendance is expected during the Summer Session. WASHBURN, RUGGLES, HOWARD, MOORE.

107-108. IMMATURE STAGES OF INSECTS. A study of immature forms of economic insects. Laboratory work. RUGGLES.

109-110. ACTION OF INSECTICIDES. A study of the common insecticides and their action on insects and their hosts. Laboratory and conference work. MOORE.

## GYMNASIUM

Instructor D. C. MITCHELL.

A gymnasium fee of $1.50 will be charged each semester.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | Gymnasium | 0 | All | None |
| 2. | Gymnasium | 0 | All | 1 |

### INTRODUCTORY COURSES

1. GYMNASIUM. Calisthenics, light apparatus and corrective work. Swimming and diving.

2. GYMNASIUM. Continuation of course 1 adding games of hand ball, indoor baseball, basketball, and volley ball. Students must be able to swim the length of the pool.

## HORTICULTURE

Associate Professors LE ROY CADY, MAXWELL J. DORSEY; Assistant Professors WILFRID G. BRIERLEY, RICHARD WELLINGTON; Extension Specialist ROGER S. MACKINTOSH.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

## COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | ***Introductory Courses*** | | | |
| 4. | Commercial Fruit Growing..... | 4 | Jr., sr. | Bot. 1 yr., Hort. 1 sem. |
| 19. | Fruit Handling ..... | 4 | Jr., sr. | 4, 21, Econ. 3 |
| 21b. | Small Fruits and Viticulture... | 3 | Jr., sr. | Bot. 1 yr. |
| 32. | Market Gardening ..... | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 50. | Floriculture ..... | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 54. | Greenhouse Construction and Management ..... | 1½ | Jr., sr. | None |
| 56. | Plant Propagation ..... | 1 | Soph., jr., sr. | None |
| 71. | Landscape Gardening ..... | 3 | Soph., jr., sr. | None |
| 73. | Nursery Practice ..... | 1½ | Soph., jr., sr. | None |
| 90a,b. | General Horticulture ..... | 3 | All | None |
| 94. | Home and School Gardening.... | 3 | Jr., sr. | 90 |
| | *Advanced Courses* | | | |
| 101. | Advanced Fruit Growing..... | 3 | Sr. | 4, 21 |
| 103. | Tropical Fruits ..... | 3 | Sr. | 4, 21 |
| 105. | Systematic Pomology ..... | 3 | Jr., sr. | 4, 21 |
| 107. | Orchard Management ..... | 3 | Sr. | 19 |
| 131. | Advanced Market Gardening.... | 3 | Sr. | 32 |
| 151-152. | Advanced Floriculture ..... | 6 | Sr. | 50, 54 |
| 191. | Hort. Literature ..... | 3 | Sr. | 4 |
| 193-194. | Hort. Seminar ..... | 2 | Jr., sr. | 12 cred. excl. of 90 |

### INTRODUCTORY COURSES

4. COMMERCIAL 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. BRIERLEY.

19. FRUIT HANDLING. Lectures on early development, packages, harvesting, packing, by-products, coöperation, marketing, and storage. Laboratory in picking and packing of fruits, reference work on marketing and storage. Alternates with 107. Offered in 1916-17. BRIERLEY.

21b. SMALL FRUITS AND VITICULTURE. Lectures, references, and laboratory. Botanical relationship, important species, origin, commercial development, importance, climatic range, sites, soils, propagation, planting plans, planting, pruning, cultivation, irrigation, cover-crops and mulching, inter-cropping and varieties. BRIERLEY.

32. MARKET-GARDENING. The principles of vegetable-growing for market, including the study of all important vegetable crops from seed to harvest. Lectures, recitations, references, laboratory work, and excursions. .....

50. FLORICULTURE. Instruction is given in a variety of subjects designed to give the student a working knowledge of the culture and uses of common house plants, annuals, perennials, and greenhouse plants. Lectures, reference reading, and laboratory. CADY.

54. GREENHOUSE CONSTRUCTION AND MANAGEMENT. A study of the evolution of the greenhouse, types of houses, materials, and methods of construction. Lectures, field trips, and laboratory work. CADY.

56. PLANT PROPAGATION. Methods of propagation of plants by seed, cuttings, layers, grafting, and budding are studied. The principles of greenhouse management, transplanting, watering, and ventilation are taught. Lectures, reference reading, field and laboratory work. CADY.

71. LANDSCAPE GARDENING. A general course in the practice and principles of landscape gardening as applied to the home and community. Lectures and field trips to parks and private grounds. CADY.

73. NURSERY PRACTICE. Lectures and practice work in management of nursery stock, seeds, bulbs, and plants, particular attention being given to ornamental stock propagation, planting, and storage. CADY.

*90a,b. GENERAL HORTICULTURE. A general survey of horticulture with a consideration of the elementary principles of fruit-growing, vegetable gardening, floriculture, landscape gardening, plant breeding, plant forcing, and plant propagation. BRIERLEY.

94. HOME AND SCHOOL GARDENING. Lectures and laboratory. A consideration of the elements of horticulture as applied to high-school instruction, plant propagation, fruit growing, home gardening, school gardening, and the planning of home and school grounds. Same as Agr. Educ. 68. BRIERLEY, LUSK.

ADVANCED COURSES

101. ADVANCED FRUIT-GROWING. Lectures, laboratory, and special problems. A study of the various tree fruits. Similar in outline to course 21b. Alternates with 103. Offered in 1916-17. BRIERLEY.

103. TROPICAL FRUITS. Lectures, references, and special problems. A study of the various tropical and citrus fruits. Similar in outline to course 21b. Alternates with 101. Not offered in 1916-17. BRIERLEY.

105. SYSTEMATIC POMOLOGY. The classification and distribution of temperate, sub-tropical, and tropical fruits; technical description, identification, and general study of the more important varieties; judging of fruits; fruit literature. Lectures, laboratory work, references. WELLINGTON.

107. ORCHARD AND GARDEN MANAGEMENT. Lectures, references, laboratory, and special problems. A study of the principal problems connected with the management of orchard, small fruit and vegetable tracts. Alternates with 19. Not offered in 1916-17. BRIERLEY.

131. ADVANCED MARKET-GARDENING. Lectures, references, and special problems. A study in detail of the various vegetables. WELLINGTON.

* Students specializing in Horticulture may substitute for Hort. 90 any course in Horticulture for which they are eligible. Students majoring in other divisions who desire to take more specialized work in Horticulture may substitute Hort. 4, 21, 32, 50 or 71, provided that a second course from the same group be elected later.

151-152. ADVANCED FLORICULTURE. Lectures, assigned readings, laboratory, and special problems dealing with the culture, botany, and history of florists' plants and methods of greenhouse management. CADY.

191. HORTICULTURAL LITERATURE. This course includes a critical study of foreign and native horticultural literature, and the methods used in the preparation of fruit monographs and bulletins. A knowledge of French and German will be a valuable asset. Lectures. WELLINGTON.

193-194. HORTICULTURAL SEMINAR. Required of all graduate students and of seniors electing special problem work. Reports and discussion of problems and investigational work; first, as projected; second, in development; and third, as completed. HORTICULTURAL STAFF.

## JOURNALISM

Associate Professor WILLIAM P. KIRKWOOD; Instructor LIVY G. HOOD.

*General statement.*—The aim of this Division is to give practical training in writing for the press and in newspaper management. The work at the College of Agriculture is intended to aid students in agriculture in writing for the rural and the agricultural press, and in the preparation of agricultural bulletins.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3. | News-Writing | 3 | Soph., jr., sr. | Rhet. 1 yr. |
| 7-8. | News-Gathering and Reporting | 6 | Jr., sr. | 3 |
| 9. | Copy-Reading and Headline Writing | 3 | Jr., sr. | 7-8 |
| 11-12. | Agricultural Journalism | 6 | Soph., jr., sr. | Rhet. 1 yr. |
| 13. | The Editorial | 3 | Jr., sr. | 7-8 |

INTRODUCTORY COURSES

3. NEWS-WRITING. Organization, methods, and material in newspaper production; newspaper English; news values; the news story; newspaper copy; writing the lead; feature and human-interest stories; the interview; correspondence. Lectures and practical work. KIRKWOOD, HOOD.

7-8. NEWS-GATHERING AND REPORTING. Laboratory practice, teaching by actual assignments on *The Minnesota Daily* and other publications. Methods of gathering and writing news. HOOD.

9. COPY-READING AND HEADLINE WRITING. Laboratory course in editing copy and writing headlines. Work done for various University publications. HOOD.

11-12. AGRICULTURAL JOURNALISM. Gathering and writing agricultural news; writing of articles for the agricultural press. Lectures and assignments. KIRKWOOD.

13. THE EDITORIAL. Presentation of editorial interpretation and com-

ment; editorial style. Editorial direction and control of newspapers. Laws relating to newspaper publications, particularly the law concerning libel. Lectures and practice in preparing editorial copy. KIRKWOOD.

## MILITARY SCIENCE AND TACTICS

Professor and Commandant BERNARD LENTZ; Assistant Commandant and Brigade Adjutant WALTER F. RHINOW; Band Instructor BERT ROSE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Military Drill | None | Fr. | None |
| 3-4. | Military Drill | None | Soph. | 1-2 |
| 5-6. | Military Drill | 3† | Jr., sr. | 3-4 |
| 8. | Military Science | 2* | Jr., sr. | 3-4 |

1-6. MILITARY DRILL. Two years are required of all men who enroll in the freshman and sophomore classes. Students are cautioned to report for the first drill and inform themselves of the requirements of the department.

1-2. Freshman: Practical instruction in schools of the soldier, company, and battalion signals, ceremonies, first aid.

3-4. Sophomore: Practical and theoretical instruction in schools of the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

5-6. May be taken voluntarily by others outside of the freshman and sophomore classes. No credit will be allowed for such drill for less than one year.

8. MILITARY SCIENCE. Instruction in advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

* If taken in connection with course 5-6.

† No student may receive more than a total of six credits for elective work in both Physical Education and Military Drill.

## PLANT PATHOLOGY AND BOTANY

Professor EDWARD M. FREEMAN; Associate Professor ELVIN C. STAKMAN; Assistant Professor WIELAND L. OSWALD; Instructors GUY R. BISBY, ROBERT C. DAHLBERG, ESTELLE LOUISE JENSEN; Extension Specialist ARNE G. TOLAAS.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

## COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | Plant Pathology | 3 | Jr. | Bot. 1 yr. |
| 6. | Plant Pest Control | 3 | Jr., sr. | 1, Econ. Zool. 3 |
| 7. | Weeds and Grasses | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 9. | Weeds and Seed Testing | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 10. | Forest Pathology | 3 | Soph. | Bot. 1 yr. |
| 12. | Seed Problems | 3 | Jr., sr. | 9 |
| 14. | Plant Disease Control | 3 | Jr., sr. | 1, Econ. Zool 3 |
| | *Advanced Courses* | | | |
| 103. | Bacterial Diseases | 3 | Jr., sr. | 1, Path. 58 |
| 104. | Principles of Pathology | 3 | Jr., sr. | 1, Path. 58 |

### INTRODUCTORY COURSES

1. PLANT PATHOLOGY. Elementary study of plant diseases due to fungi bacteria and slime molds; life-histories and preventive methods. Lecture, laboratory, and reference. Not open to those who have completed course 10. FREEMAN, JENSEN.

6. PLANT PEST CONTROL. Given jointly by the Division of Plant Pathology and Botany and the Division of Economic Zoology. Same as Econ. Zool. 16. The theory and practice of control of insect and fungous pests of crop plants. Practical applications. Not open to those who have completed course 14 or Econ. Zool. 18. Given in alternate years; offered in 1916-17. STAKMAN, RUGGLES, BISBY.

7. WEEDS AND GRASSES. Agricultural and applied botanical study of weeds and grasses with special reference to agricultural importance. OSWALD.

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. OSWALD, DAHLBERG.

10. FOREST PATHOLOGY. Elementary study of plant diseases due to fungi, bacteria, and slime-molds; life histories and preventive methods. Lectures, laboratory, and reference. Not open to those who have completed course 1. FREEMAN, STAKMAN.

12. SEED PROBLEMS. Special seed problems are assigned. Advanced work in seed testing methods. OSWALD, DAHLBERG.

14. PLANT DISEASE CONTROL. A detailed study of methods of controlling diseases of plants of parasitic origin. Spray materials and spray machinery. Practical applications. Not open to those who have completed course 6. Given in alternate years; not offered in 1916-17. STAKMAN, BISBY.

### ADVANCED COURSES

103. BACTERIAL DISEASES. Morphology, classification and physiology of phytopathogenic bacteria; general phenomena of bacterial infection and host reaction; detailed study of plant diseases caused by bac-

teria and filterable viruses. Required for specializing in pathology or entomology. STAKMAN.

104. PRINCIPLES OF PATHOLOGY. Comparative biology of plant pathogens; pathological plant anatomy, parasitism, biologic specialization, resistance, and immunity. Required for specializing in pathology or entomology. STAKMAN.

## RHETORIC

Assistant Professor ROBERT C. LANSING; Instructors ESTELLE COOK, GEORGE G. GLICK, RUTH MOHL.

*General statement.*—Beginning with the class entering in September, 1915, rhetoric credits will not be granted officially until the close of the first semester of the senior year.

At least one quiz paper will be selected at random each semester from other than rhetoric classes and read by the Committee on Delayed English Credit. In addition any instructor may nominate to the committee and submit papers for any junior or senior who in his opinion requires special consideration.

The Committee on Delayed English Credit may require upper-class students to take, without credit, additional courses in rhetoric in order to validate their freshman and sophomore rhetoric credits.

Until June, 1918, students registered previous to September, 1915, may be required to take a supplementary three-credit course in rhetoric in place of three of the elective credits required for the degree.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Rhetoric | 3 | Fr. | None |
| 2a,b. | Rhetoric | 3 | Fr. | 1 |
| *11a,b. | Argumentation | 3 | Soph., jr. | 2 |
| 12. | Argumentation | 3 | Soph., jr. | 11 |
| 13a,b. | Adv. Argumentation | 3 | Soph., jr., sr. | 12 |
| 21-22. | Public Speaking | 6 | Soph., jr., sr. | 2 |

INTRODUCTORY COURSES

1a,b. RHETORIC. Note taking, thesis writing, exposition, sentence structure, analysis of prose models. LANSING, GLICK, MOHL.

2a,b. RHETORIC. Narration, description, diction. LANSING, GLICK, MOHL.

11a,b. ARGUMENTATION. Evidence, methods of reasoning, briefing, debating. LANSING, GLICK, MOHL.

12. ARGUMENTATION. Analysis of persuasive speeches, practice in speaking both from the floor and in formal debate, composition of persuasive articles. LANSING, GLICK.

13a,b. ADVANCED ARGUMENTATION. A course designed primarily for those

* Offered second semester only to Home Economics students.

intending to participate in intercollegiate and society debates, oratorical contests and extension courses. GLICK.

21-22. PUBLIC SPEAKING. The study and practice of the fundamental principles of voice production, articulation, gesture, platform deportment, and expression. COOK.

## SOILS

Professor FREDERICK J. ALWAY; Associate Professor .....; Instructors PAUL R. MCMILLER, CLAYTON O. ROST; Extension Specialist GEORGE H. NESOM.

*General statement.*—For specialization in this department see special requirements in Course of Study.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3. | Soil Physics and Management.. | 3 | Jr. | Chem. 1 yr. |
| 4. | Soil Fertility and Fertilizers.... | 3 | Jr. | 3 |
| | *Advanced Courses* | | | |
| 102. | Soil Chemistry ..... | 5 | Sr. | 3, 4, 108 |
| 105-106. | Special Problems in Soils..... | † | Sr | 3, 4, 101 |
| 107a,b. | Mechanical Analysis of Soils... | 2 | Jr., sr. | None* |
| 108. | Chemical Analysis of Soils..... | 3 | Sr. | 3, 4, Quant. Anal. |

* Must be preceded or accompanied by course 3.
† Credit according to the amount of work.

### INTRODUCTORY COURSES

3. SOIL PHYSICS AND MANAGEMENT. Origin, mechanical composition, classification, and physical properties of soils; tillage operations in relation to moisture supply; micro-organisms of the soil. Lecture, laboratory, and field work. ALWAY, MCMILLER.

4. SOIL FERTILITY AND FERTILIZERS. Chemical composition of soils; farm manures; green manures; commercial fertilizers, composition and use; soil amendments; unproductive soils and their reclamation. Lecture and laboratory work. ALWAY, MCMILLER.

### ADVANCED COURSES

102. SOIL CHEMISTRY. A laboratory course on the chemical examination of soils including peat and alkali soils. A more advanced course than 108. .....

105-106. SPECIAL PROBLEMS IN SOILS. Individual laboratory or field work upon some special soil problem in soil physics or soil management. Arrangements must be made in advance. ALWAY.

107a,b. MECHANICAL ANALYSIS OF SOILS. A laboratory course on the beaker, centrifuge, and elutriator methods of mechanical analysis. MCMILLER.

108. CHEMICAL ANALYSIS OF SOILS. A laboratory course on the quantitative determination of the most important soil constituents. .....

## VETERINARY SCIENCE

Professor MYRON H. REYNOLDS; Assistant Professor WILLARD L. BOYD; Instructor CHARLES C. PALMER.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 5. | Animal Breeding ..... | 3 | Sr. | An. Biol. 3-4 |
| 6. | Veterinary Medicine ..... | 3 | Jr. | None |
| 12. | Common Diseases of Domestic Animals ..... | 3 | Sr. | 24 |
| 14. | Hog Cholera ..... | 1 | Jr., sr. | None |
| *18. | Advanced Anatomy of Digestion.... | 1½ | Jr., sr. | 24 |
| †20. | Advanced Physiology of Nutrition.. | 1½ | Jr., sr. | 24 |
| 22. | Advanced Anatomy of Locomotion and Conformation ..... | 3 | Jr., sr. | 24 |
| 24. | The Animal Body ..... | 3 | Soph., jr., sr. | None |
| 25. | The Animal Body ..... | 3 | Soph., jr., sr. | 24 |

* First half of semester.
† Second half of semester.

### INTRODUCTORY COURSES

5. ANIMAL BREEDING. Anatomy and physiology of reproduction. Variation, heredity, the laws of transmission and the application of these to the breeding of farm animals. Sterility and disease of the reproductive organs. PALMER.

6. VETERINARY MEDICINE. Planned for students who can take only one semester of veterinary work. Includes preparatory work for the study of diseases, causes, prevention, diagnosis and treatment of the common diseases including lameness, unsoundness, and common medicines. REYNOLDS.

12. COMMON DISEASES OF DOMESTIC ANIMALS. Planned as an introductory course. Cause, diagnosis, prevention, and treatment of common diseases capable of easy diagnosis and either prevention or simple treatment. General principles of diagnosis, preparation and administration of common medicines. BOYD.

14. HOG CHOLERA. A detailed study of various phases of hog cholera and the use of serum. Lectures and laboratory work. Course intended especially for students specializing in Animal Husbandry and Agricultural Education. .....

18. ADVANCED ANATOMY OF DIGESTION. Anatomy of the digestive organs of the horse, cow, sheep, and hog compared in dissection, reading, and lecture as a basis for advanced physiology of nutrition. PALMER.

20. ADVANCED PHYSIOLOGY OF NUTRITION. Physiology of digestion, including digestive fluids, nervous mechanism, absorbtion, and metabolism as a basis for practical nutrition. Lecture and laboratory work. PALMER.

22. ADVANCED ANATOMY OF LOCOMOTION AND CONFORMATION. A laboratory course including the bones, articulations, muscles, and viscera involved in locomotion and conformation. Intended to give anatomy basis for intelligent understanding of conformation and locomotion. PALMER.

24. THE ANIMAL BODY. The general principles of anatomy and physiology. A preparatory course for Common Diseases of Domestic Animals, and the advanced courses. PALMER.

25. THE ANIMAL BODY. Special physiology of domestic animals. Lecture and laboratory work. PALMER.

## COURSES IN OTHER SCHOOLS AND COLLEGES

The following courses are offered to students in the College of Agriculture by departments of other schools and colleges of the University. For complete lists and descriptions of courses offered by these departments, see the bulletins of the several schools and colleges.

## ANIMAL BIOLOGY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors HENRY F. NACHTRIEB, THOMAS S. ROBERTS, CHARLES P. SIGERFOOS; Associate Professor HAL DOWNEY; Assistant Professors CHARLES W. HOWARD, ELMER LUND, OSCAR W. OESTLUND; Instructors GEORGE D. ALLEN, CHARLES E. JOHNSON, ADOLPH RINGOEN; Teaching Fellow ROYAL N. CHAPMAN.

*General statement.*—Courses in this Department are closely correlated with those offered by the Division of Economic Zoology of the College of Agriculture. For courses of that Division see page 40.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3-4. | General Zoology | 6* | All | None |
| 7-8. | Histology and Embryology | 6* | Soph., jr., sr. | 3-4 |
| 9-10. | General Zoology | 6* | Fr. H. E. | None |
| 15-16. | General Physiology | 6* | Soph., jr., sr. | 12 cred. incl. 3-4, Chem. 3 |
| 19-20. | Comparative Gross Anatomy of Vertebrates | 6* | Soph., jr., sr. | 3-4 |
| 23-24. | Entomology | 6* | Soph., jr., sr. | 3-4 |
| 26. | Medical Entomology | 3 | Jr., sr. | 3-4 or equivalent |
| 28. | Ornithology | 3 | Soph., jr., sr. | 3-4 |
| 51. | Protozoology | 3 | Jr., sr. | 9 cred. incl. 3-4 |

* Both semesters must be completed before credit is given.

*Advanced Courses*

| | | | |
|---|---|---|---|
| 101-102. Advanced Entomology ..... | 6 | Jr., sr. | 23-24 or equivalent |
| 115-116. Mammalogy ..... | 6 | Jr., sr. | 7-8 or equivalent |
| 131-132. Embryology ..... | 6 | Jr., sr. | 7-8 |
| 143-144. Genetics and Eugenics..... | 6 | Sr. | 7-8, 15-16 |

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

## INTRODUCTORY COURSES

3-4. General Zoology. A survey of the animal kingdom emphasizing the principles of development and structure in relation to functions and habit, heredity and evolution and the animals of economic importance. Lectures, quizzes, and laboratory. Nachtrieb, Allen, Ringoen.

7-8. Histology and Embryology. A comparative microscopic study of the origin and structure of the tissues of vertebrates and invertebrates, and of the organs of mammals. Textbook, lectures, and laboratory. Downey.

9-10. General Zoology. A course in general zoology for the students in Home Economics. Emphasis will be given to the classes having a more direct bearing on home economics. Lectures, quizzes, and laboratory work. Nachtrieb, Allen, Ringoen.

15-16. General Physiology. Characteristic properties of living substance as shown by preparation and properties of typical biological compounds, colloids, enzyme action, growth, inanition, production of movements, heat, electricity, and light. Mechanisms and conditions of excitation and response. Lund.

19-20. Comparative Gross Anatomy of Vertebrates. *Lower vertebrates.* Dissection and study of selected types, cyclostomes to reptiles or birds inclusive; special consideration of history of organ systems. *Mammalian anatomy.* An intensive study of the cat. Textbook, laboratory guide. Lectures, laboratory, quizzes. Johnson.

23-24. Entomology. Elements of entomology leading up to discussion of the principles of taxonomy and their application to the classification of insects. Textbook, lectures, quizzes, and laboratory work. Oestlund.

26. Medical Entomology. Study of insects and their near relatives which are disease-bearers or are parasites on man. Special emphasis is placed upon life-history habits, and methods of control. A course for students in medicine; elective to others. Howard.

28. Ornithology. The study of the structure, classification and habits; special reference to birds of Minnesota. Considerable time devoted to field study. Bird or field-glasses and handbook required. Laboratory, lectures, quizzes. Class limited to 10. Roberts.

51. Protozoology. Lectures, reference and laboratory work on the structure and life-histories of Protozoa, with special reference to the relations of the Protozoa to diseases of animals. Sigerfoos.

### ADVANCED COURSES

101-102. ADVANCED ENTOMOLOGY. Advanced work in the ecology and taxonomy of insects. Lectures, laboratory, and field work. OESTLUND.

115-116. MAMMALOGY. Structure and classification of North American mammals. The mammalian skeleton; its modifications, with consideration of our domestic animals; dissection of a typical mammal. Classification, natural history and geographic distribution with special reference to Minnesota mammals. JOHNSON.

131-132. EMBRYOLOGY. A brief survey of general embryology, and the organogeny of the vertebrates with special reference to the circulatory system. Conference, reference and laboratory work with Kellicott's *General Embryology* and *Outlines of Chordate Development* as text. NACHTRIEB.

143-144. GENETICS AND EUGENICS. Facts and theories of heredity and the application of the laws governing natural inheritances for the improvement of a race. Lectures, reference, conference, and laboratory work. NACHTRIEB.

## BOTANY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors FREDERIC E. CLEMENTS, CARL OTTO ROSENDAHL, JOSEPHINE E. TILDEN; Assistant Professors HERBERT F. BERGMAN, NED L. HUFF; Instructor WILLIAM S. COOPER; Assistants DONALD FOLSOM, FRANCES LONG, HARVEY STALLARD.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | General Botany | 3 | All | None |
| 2. | Structural Botany | 3 | All | 1 or 3 |
| 3a,b. | Evolution of Plants | 3 | All | 1 or equiv. |
| 4. | Field and Garden Botany | 3 | All | 1 or 3 |
| | *Intermediate Courses* | | | |
| 5-6. | Plant Morphology | 3 or 6 | Soph., jr., sr. | 6 cred.: see note under course |
| 7-8. | Taxonomy | 3 or 6 | Soph., jr., sr. | 6 cred.: see note under course |
| 9-10. | Physiology and Ecology | 3 or 6 | Soph., jr., sr. | 6 cred. |
| 11-12. | Industrial Botany | 3 or 6 | Soph., jr., sr. | 6 cred. incl. 2 or 3 |
| 13-14. | Mycology | 3 or 6 | Soph., jr., sr. | 6 cred. |
| | *Advanced Courses* | | | |
| 101-102. | Applied Ecology | 3 or 6 | Jr., sr. | 9 cred. |
| 103. | Foodstuffs and Textiles | 3 | Jr., sr. | 9 cred. |
| 111-112. | Advanced Taxonomy | 6 | Jr., sr. | 7-8 |
| 113-114. | Advanced Ecology | 6 | Jr., sr. | 9-10 |
| 115-116. | Advanced Physiology | 6 | Jr., sr. | 9-10 |
| 117-118 | Cytology | 6 | Jr., sr. | 18 cred. |

| | | | |
|---|---|---|---|
| 119-120. Advanced Industrial Botany.... | 6 | Jr., sr. | 11-12 |
| 121-122. Plant Studies and Methods..... | 6 | Jr., sr. | 12 cred. |

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

## INTRODUCTORY COURSES

1a,b. General Botany. A study of the external form and organs of flowering plants, root, stem, leaf, fruit and seed, and of their relations to each other, together with simple greenhouse experiments to illustrate the various functions. Clements, Huff, Bergman, Cooper, Folsom, Long, Stallard.

2. Structural Botany. A study of the microscopic structure of flowering plants, the cell, tissues and tissue systems, as seen in the root, stem, leaf, etc. Huff, Stallard.

3a,b. Evolution of Plants. A comparative study of selected types of plants, illustrating the evolution of land plants from the simplest forms. Tilden, Huff.

4. Field and Garden Botany. Greenhouse, garden, and field study of the form, behavior, naming, and relationships of flowering plants, together with individual problems in the pollination, reproduction and propagation of common flower types. Clements, Bergman, Cooper, Folsom, Long, Stallard.

## INTERMEDIATE COURSES

Either semester in the following courses open to students with the proper prerequisites.

5-6. Plant Morphology. A comparative study of the form, structure, and life history of typical algae, fungi, liverworts, mosses, ferns, and seed plants. Course 6 but not 5, open to those who have taken Course 3. .....

7-8. Taxonomy. A general study of the classification and relationships of flowering plants. Laboratory and field practice in the determination of species, together with lectures and quizzes. Course 8 (but not 7) open to those who have taken Course 4. Rosendahl.

9-10. Physiology and Ecology. Greenhouse and field study of physical factors and plant responses, absorption, transport, water loss, nutrition, growth, fertilization, reproduction, and adaptation; field study of habitat, migration, competition, invasion, and succession. Clements, Cooper.

11-12. Industrial Botany. Laboratory study of the plants which are useful to man, including those which furnish food, shelter, fuel, clothing, etc. Tilden.

13-14. Mycology. The classification and life history of the various groups of fungi, based on identification, field work, and cultures. Clements, Bergman.

### ADVANCED COURSES

101-102. APPLIED ECOLOGY. A study of the physiological processes and the ecological principles and methods involved in the production of field, garden and forest crops. Either semester open to students who have had introductory botany, physiology, and ecology. CLEMENTS.

103. PLANT FOODSTUFFS AND TEXTILES. A special study of the botany of foods, textile fibers and fabrics, together with an inquiry into the relation of plants to household processes and problems. For young women. TILDEN.

111-112. ADVANCED TAXONOMY. 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. Laboratory, field work, lectures, and quizzes. ROSENDAHL.

113-114. ADVANCED ECOLOGY. A critical study of plant habitats by means of instruments and the adaptations produced by water and by light, together with careful examination of the causes and reactions of plant formations. CLEMENTS, COOPER.

115-116. ADVANCED PLANT PHYSIOLOGY. A study of the relations of factor, function, and structure in the various organs of plants, with special reference to absorption, transpiration, photosynthesis, respiration, irritability, and reproduction. Class discussions and quizzes, greenhouse and field work. CLEMENTS, BERGMAN.

117-118. CYTOLOGY. A survey of cell structure and the various phenomena of division, fusion, and metamorphosis, together with a review of the history of cytological investigation. Methods of cytological research indicated in the laboratory. ROSENDAHL.

119-120. ADVANCED INDUSTRIAL BOTANY. A study of the origin, distribution and cultivation of plants yielding products of economic value, the nature and uses of these products and the processes by which they are obtained from the plants. TILDEN.

121-122. PLANT STUDIES AND METHODS. Nature study and high-school botany presented as they are to be taught; the material is taken up in detail in proper sequence. Training in method is afforded by practice in the University High School. CLEMENTS.

## CHEMISTRY

### SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Assistant Professor IRA H. DERBY; Instructors ROSS A. BAKER, WOLF KRITCHEVSKY, WOLDEMAR M. STERNBERG.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3a-4b, 3b-4a. | Adv. General Chem. and Qualitative Analysis ..... | 6* | Fr., soph., jr. | Entrance cred. in Chem. |
| 11-12. | Quantitative Analysis ..... | 8* | Soph., jr., sr. | 3-4 or 7-8 |
| 33. | General Chem. and Qual. Analysis ..... | 5** | Fr., soph., jr. | None |
| 35-36. | Organic Chemistry ..... | 8* | Soph., jr., sr. | 3-4 or 7-8 |
| | *Advanced Courses* | | | |
| 121-122. | Physical Chemistry ..... | 4* | Jr., sr. | 36, Phys. 2 and 4 |
| 123-124. | Physico-Chemical Laboratory | 2* | Jr., sr. | See statement |

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

* Both semesters must be completed before credit is given for the first semester.

** Course 4b must be completed before credit is given.

INTRODUCTORY COURSES

3a-4b, 3b-4a. ADVANCED GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. Lectures, recitations, and laboratory work. General descriptive chemistry, including the fundamental theories and laws, and qualitative analysis. FRANKFORTER, BAKER.

11-12. General discussion of quantitative methods, with laboratory work in gravimetric analysis, first semester, followed by a discussion of standard solutions and the necessary stoichiometric calculations, with laboratory work in volumetric analysis, second semester. SIDENER, STERNBERG.

33. GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. Designed for those who have had no high school chemistry; in preparation for Course 4b. See statement under 3a-4b. FRANKFORTER, BAKER.

35-36. ORGANIC CHEMISTRY. This course includes the aliphatic and the aromatic series with the preparation of the more important compounds. FRANKFORTER, KRITCHEVSKY.

ADVANCED COURSES

121-122. PHYSICAL CHEMISTRY. A consideration of the theories and laws, phenomena and processes which form the basis of chemical science. Charts, models, and experiments are employed to supplement and illustrate the discussions. DERBY.

123-124. PHYSICO-CHEMICAL LABORATORY PRACTICE. Open only to students pursuing Course 121-122 or who have had it or its equivalent. Physico-chemical methods and measurements. DERBY.

## ECONOMICS

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors JOHN H. GRAY, E. DANA DURAND; Assistant Professors ROY G. BLAKEY, J. FRANKLIN EBERSOLE; Instructors LLOYD M. CROSGRAVE,

WILLIAM W. CUMBERLAND, HARRY D. HARPER, ALBERT C. JAMES, ROBERT J. MCFALL.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| †1b. | Indust. Hist. since 1750 | 3 | All | None |
| †2a. | Indust. and Commerce of U. S. | 3 | All | None |
| †3a,b. | Principles of Economics | 3 | Soph., jr., sr. | 1 or 2 |
| 4a,b. | Economic Problems | 3 | Soph., jr., sr. | 3 |
| 13. | Econ. Geog. of For. Countries | 3 | Soph., jr., sr. | 2 |
| †18. | Problems in Agricultural Econ. | 3 | Soph., jr., sr. | 3 |
| †19. | Marketing of Farm Products | 3 | Jr., sr. | 3 |
| 34. | Business Management | 3 | Soph., jr., sr. | 3 |
| 35-36. | Accounting Principles | 6* | Soph., jr., sr. | None |
| 37. | Marketing of Products | 3 | Jr., sr. | 3 |
| 43a,b. | Banking | 3 | Soph., jr., sr. | 3 |
| 46. | Property Insurance | 3 | Soph., jr., sr. | 3 |
| | *Advanced Courses* | | | |
| 101. | Statistics | 3 | Jr., sr. | 6 cred. incl. 3 |
| 141. | Money and Prices | 3 | Jr., sr. | 3 and 43 |
| 145. | The Modern Business Corporation | 3 | Jr., sr. | 6 cred. incl. 3 |
| 161. | Labor Problems | 3 | Jr., sr. | 3 and 4 |
| 164. | Econ. Functions of the State | 3 | Jr., sr. | 6 cred. incl. 3 |
| 173. | Econ. of Transportation | 3 | Jr., sr. | 6 cred. incl. 3 |
| 191. | Public Finance | 3 | Jr., sr. | 6 cred. incl. 3 |
| 192. | State and Local Taxation | 3 | Jr., sr. | 191 |
| 251-252. | Sem. in Agric. Economics | 6* | Sr. | 18, 19 |

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

* Both semesters must be completed before credit is given for the first semester.
† Given at University Farm.

INTRODUCTORY COURSES

(Courses 1a and 2b, same as 1b and 2a, are given at the University Campus.)

1b. INDUSTRIAL HISTORY SINCE 1750. Economic effects of inventions, wars, political changes, increased supply of precious metals, improved transportation, and modifications of business organization in chief European countries and the United States. GRAY.

2a. INDUSTRIES AND COMMERCE OF THE UNITED STATES. Agricultural, mining, manufacturing industries and commerce. Characteristics of the several sections of the country. Leading individual industries: geographical distribution, methods of organization, production, and marketing, and relationships to one another. MCFALL.

3a,b. PRINCIPLES OF ECONOMICS. Fundamentals of economic theory with special reference to agriculture. CUMBERLAND.

4a,b. ECONOMIC PROBLEMS. A survey of the fundamentals in the problems of labor, social insurance, socialism, government ownership, cor-

porations, trusts, monopolies, transportation, banking, protection, free trade, public revenues and expenditures. BLAKEY.

13. ECONOMIC GEOGRAPHY OF FOREIGN COUNTRIES. Economic basis of modern civilization; localization of industries; trade routes, principal extractive, manufacturing and distributive industries of leading foreign countries, especially markets for American trade. Special emphasis will be laid on South America. MCFALL.

18. PROBLEMS IN AGRICULTURAL ECONOMICS. The practical economic problems which confront the farmer as a producer, consumer, and citizen; land settlement and development; size of farms; intensity of cultivation; tenancy; credit; marketing; coöperation; taxation; protective duties; foreign markets; transportation. DURAND.

19. MARKETING OF FARM PRODUCTS. The organization and methods of marketing; the functions of middlemen; the costs of marketing various products; coöperative marketing. DURAND.

34. BUSINESS MANAGEMENT. The principles of efficiency in business operation and forms of organization to apply them; the typical departments of a business; their functions, office organization and administration. Textbook, assigned readings, and lectures. HARPER.

35-36. PRINCIPLES OF ACCOUNTING. Purposes of accounts and principles of account classification; capital and revenue; accruals; principles of valuation; depreciation; preparation and interpretation of balance sheets, income accounts, and other business statements; corporation accounts. Laboratory course with supplementary lectures. HARPER.

37. MARKETING OF PRODUCTS. Merchandising problems of manufacturers, wholesalers, and retailers; distributing system and market organization; price policies. JAMES.

43a,b. PRINCIPLES AND PRACTICE OF BANKING. Contemporary banking institutions, both national and state; their incorporation, organization, administration; reserves, note issues, clearing houses, domestic and foreign exchange; the banking systems of foreign countries; and the Federal Reserve Banks of the United States. EBERSOLE.

46. PROPERTY INSURANCE. Basic theory and critical examination of policy contracts of fire, marine, other casualty, title, and credit insurance. JAMES.

## ADVANCED COURSES

101. THEORY AND PRACTICE OF STATISTICS. Principles of collection, tabulation, and interpretation of statistical material, illustrated by present-day statistical data. Lectures, assigned readings, and special investigations by individual members of the class. DURAND.

141. MONEY AND PRICES. The functions of money; the nature and effects of credit; changes in prices as shown by index numbers; in-

ternational movements of gold; monetary standards and currency systems; the problem of securing an ideal money. EBERSOLE.

145. THE MODERN BUSINESS CORPORATION. The organizing, financing, and managing of corporations; the position of the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. GRAY.

161. LABOR PROBLEMS. Modern labor problems; woman and child labor, industrial education, unemployment, poverty, industrial hygiene, welfare work, profit sharing, coöperation, labor unions, strikes, boycotts, conciliation and arbitration; economic causes and effects of immigration. CROSGRAVE.

164. THE ECONOMIC FUNCTIONS OF THE STATE. The proper limits of state interference with private property, freedom of contract and individual liberty. Police powers of the state. Legislation concerning factories, female and child labor, minimum wage, social insurance, etc. CROSGRAVE.

173. ECONOMICS OF TRANSPORTATION. Survey of railways and railway policy of the United States and representative foreign countries; canal and ocean transportation; railway organization and finance; railway discriminations, competition, pooling and combination; the railways and labor. MCFALL.

191. PUBLIC FINANCE. Public expenditures; public debt; budgetary legislation; tax systems. BLAKEY.

192. STATE AND LOCAL TAXATION. Problems of state and local taxation. Historic survey of various taxes and examination of present procedure in taxing different kinds of property; tax reforms. Particular attention given to conditions in Minnesota. BLAKEY.

251-252. SEMINAR IN AGRICULTURAL ECONOMICS. Research problems in the marketing and distribution of farm products, agricultural credit, farm ownership and tenancy, and agricultural organizations. DURAND.

## EDUCATION

Professors LOTUS D. COFFMAN, MELVIN E. HAGGERTY, ALBERT W. RANKIN, FLETCHER H. SWIFT.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Brief Course in the Hist. of Educ.. | 3 | Jr., sr. | Phil. 1-2 |
| 3a,b. | Social Aspects of Education..... | 3 | Sr. | 1 or 101-102, 11 |
| | *Advanced Courses* | | | |
| 101. | Foundations of Modern Education. | 3 | Jr., sr. | Phil. 1-2, Hist. 6 cred. |
| 102. | History of Educ. since the Reformation ..... | 3 | Jr., sr. | Phil. 1-2, Hist. 6 cred. |

| | | | |
|---|---|---|---|
| 105. Educational Psychology ..... | 3 | Sr. | Phil. 1-2 |
| 106. Educational Psychology ..... | 3 | Sr. | Phil. 1-2 |
| 109. Educational Diagnosis ..... | 2 | Sr. | 1 or 101-102, 3 |
| 119. School Curricula ..... | 3 | Sr. | 1 or 101-102, 3 |
| 141. School Sanitation and Public Health | 3 | Sr. | 3 |
| 146. History and Principles of Religious Education ..... | 3 | Jr.,sr. | Phil. 1-2 |

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

## INTRODUCTORY COURSES

1a,b. A Brief Course in the History of Education. Current school problems and educational theories in the light of their history. Emphasis upon secondary education and those aspects of education of most immediate concern to high-school teachers. Swift.

3a,b. Social Aspects of Education. The school as a community factor; the present peculiar relation of the school to social problems; the function of the school in these relations. Rankin.

## ADVANCED COURSES

101. Foundations of Modern Education. An interpretative historical study of educational institutions and ideals, designed for those who wish a more comprehensive historical view than can be gained in Education 1. The foundations of modern education—Hebrew, Greek, Roman, Medieval. Swift.

102. History of Education Since the Reformation. Modern education movements, current theories, and standards in the light of their history. For fuller description of general character of course, see course 101. Swift.

105. Educational Psychology. Advanced work in genetic psychology, the original nature of the human organism, the origin, development and control of instincts, and the relation of instincts to the formation of habits, introductory to the psychology of learning. Haggerty.

106. Educational Psychology. The psychology of learning. Methods of measuring the rate of learning; study of typical learning experiments and an examination of the conditions of the most economic learning, study of individual differences, and the psychology of the school subjects. Haggerty.

109. Educational Diagnosis. A study of educational scales and standard tests for the measurement of efficiency in school subjects. The course will deal with the nature of the tests, the methods of their use and an analysis of results obtained. Haggerty.

119. School Curricula. The curriculum as related to social, industrial and economic conditions; a survey of the grammar grades and of the high school. Consideration of the possibilities of developing a curriculum better adapted to the community needs. Rankin.

141. School Sanitation and Public Health. A course in school hygiene in its broader aspects. Designed for all teachers and supervisors who are responsible for the health of school children. Treats of medical supervision and other problems arising from school environment. Rankin.

146. History and Principles of Religious Education. Influence of religion and religious education as social and spiritual forces among certain selected types. Principles of education as applied to religious instruction and training. Swift.

## ENGLISH

Professors Richard Burton, Hardin Craig, Carleton Brown; Assistant Professors Joseph W. Beach, Oscar W. Firkins, George N. Northrop.

*General statement.*—The following courses are recommended for election by the students of the College of Agriculture:

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1-2. | Gen. Survey Eng. Lit. | 6 | Soph., jr., sr. | Rhet. 1-2 |
| 5a,b. | Chaucer | 3 | Soph., jr., sr. | 1-2 |
| 6. | Spenser | 3 | Soph., jr., sr. | 1-2 |
| 55a,b. | Shakespeare | 3 | Jr., sr. | 1-2 |
| 66. | Browning and Tennyson | 3 | Jr., sr. | 1-2 |
| 67. | English Novel | 3 | Jr., sr. | 1-2 |
| | *Advanced Courses* | | | |
| 105. | 18th Century Poetry | 3 | Jr., sr. | 1-2 |
| 108. | Romantic Movement | 3 | Jr., sr. | 1-2 |
| 111-112. | 17th Century Prose | 6* | Jr., sr. | 1-2 |
| 115. | English Idiom | 2 | Jr., sr. | 1-2, 3 |
| 119-120. | Principles of Literary Criticism. | 6* | Jr., sr. | 1-2 |
| 133. | English and Scottish Popular Ballads | 2 | Jr., sr. | 1-2 |
| 140. | Advanced Chaucer | 2 | Jr., sr. | 5 |

* Both semesters must be completed before credit is given for the first semester.

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

### INTRODUCTORY COURSES

1-2. General Survey of English Literature from the beginning to Robert Burns. Lectures, recitations, and assigned readings. Designed to cover the whole period in historical outline, and to prepare for a more minute study of special periods. Craig, Brown, Beach, Northrop.

5a,b. Chaucer. The grammar and literary forms of fourteenth century English, with selected readings from Chaucer's works. Special attention to *The Canterbury Tales*. First semester, Brown; second semester, Firkins.

6. SPENSER. The forms and literary influences in the Elizabethan period illustrated in the poetry of Edmund Spenser, with brief readings from the minor poems and extended study of *The Faerie Queene*. FIRKINS.

55a,b. SHAKESPEARE. An introductory study of Shakespeare's development as a poet and dramatist up to *King Lear*, with reading of representative plays. First semester, NORTHROP; second semester, BROWN.

59. THE MODERN DRAMA. Contemporary drama from 1870 to the present; the new impulse in dramatic literature under the stimulus of latter-day thought. BURTON.

66. BROWNING AND TENNYSON. A reading of the representative work of the two major poets of the Victorian era, in order to show their quality and contrasted power. BURTON.

67. THE ENGLISH NOVEL. Principles and personalities in the evolution of the English Novel. Written reports on selected novels. BURTON.

## ADVANCED COURSES

105. EIGHTEENTH CENTURY POETRY. The Rise of Naturalism and Romanticism. Eighteenth century English poetry from Pope to Burns, with special reference to the rise and growth of naturalism and romanticism. CRAIG.

108. THE ROMANTIC MOVEMENT. The Romantic School of poets from Wordsworth to Keats and the influence of the revolution in France. CRAIG.

111-112. SEVENTEENTH CENTURY PROSE. First semester: general survey of the prose of the century to 1660. Second semester: literature of the Restoration, with particular study of Dryden. History 3-4 is desirable as a preliminary course. NORTHROP.

115. ENGLISH IDIOM. A discussion of current idiom with the purpose of relating it to the underlying principles of historic development. BURTON.

119-120. PRINCIPLES OF LITERARY CRITICISM. A brief treatment of elements or forces in literature; an exposition of literary types in relation to the standards and methods of judging each. Instructor's permission to take the course must be obtained before registration. FIRKINS.

133. THE ENGLISH AND SCOTTISH BALLADS. A study of a large number of traditional ballads, English and foreign, and an examination of ballad style and origins. BROWN.

140. ADVANCED STUDY OF CHAUCER. Further study of *The Canterbury Tales* and of the Minor Poems. Open upon approval of instructor. BROWN.

# FORESTRY

## COLLEGE OF FORESTRY

Professor EDWARD G. CHEYNEY; Associate Professor JOHN P. WENTLING.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Forestry | 3 | All | None |
| 21. | Farm Forestry | 3 | Jr. | None |

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

### INTRODUCTORY COURSES

1. GENERAL FORESTRY. A brief history of the development of forestry in Europe and America; description of the United States forests. Lectures and collateral reading. CHEYNEY.

21. FARM FORESTRY. A study of the establishment, care, maintenance, and utilization of the farm woodlot and windbreaks. A sketch of the forestry work in Minnesota and the United States. CHEYNEY, WENTLING.

# GEOLOGY AND MINERALOGY

## COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor WILLIAM H. EMMONS; Assistant Professors FRANK F. GROUT, CHESSLEY J. POSEY; Instructors A. WALFRED JOHNSTON, TERENCE T. QUIRKE.

### COURSES

| No. | Title | Credits | Offered to | Prereq. cuorses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Geology | 3 | Soph., jr., sr. | None |
| 2. | Geology | 3 | Soph., jr. | None |
| 3. | Laboratory Work | 1 | Soph., jr., sr. | Supports 1 |
| 4. | Geology of Minnesota | 3 | Soph., jr., sr. | 1 |
| 5. | Economic Geology | 3 | Soph., jr., sr. | 1 |
| 21. | Elements of Mineralogy | 3 | Soph., jr., sr. | See statement |
| 29. | General Physiography | 3 | Soph., jr., sr. | None |
| 34. | Meteorology | 3 | Soph., jr., sr. | 1 or 29 |
| 35. | Laboratory Work | 1 | Soph., jr., sr. | Supports 29 |

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

### INTRODUCTORY COURSES

1. GENERAL GEOLOGY. A synoptical treatment of materials of the earth and of geologic processes. Physiographic, dynamic and structural geology, with a brief introduction to historical geology. Lectures, laboratory work, field excursions, map study, and conferences. EMMONS, JOHNSTON.

2. GEOLOGY. An elementary course giving a brief survey of the field of geology. Topographic map and field work. Given in College of Agriculture and Forestry only. POSEY.

3. LABORATORY WORK. Open only to students taking Course 1. Supplements Course 1 with study of rocks and ores, topographic and geologic maps and reference reading. JOHNSTON and Assistants.

4. GEOLOGY OF MINNESOTA. The physical geography and geologic history of Minnesota. The relations of industrial development to geological feautres. The principles of pre-Cambrian geology as exemplified in Minnesota. JOHNSTON.

5. ECONOMIC GEOLOGY. The mineral resources of the United States. The origin, occurrence, distribution, and uses of the more important minerals and mineral fuels of economic value. Lectures, map work, conferences, and field excursions. QUIRKE.

21. ELEMENTS OF MINERALOGY. Open to students taking Chemistry. The crystal systems; morphological, physical, and chemical character of minerals; occurrence, genesis, and uses of minerals; classification and description of common minerals. Determinative work in laboratory, blowpipe analysis, sight identification. GROUT.

29. GENERAL PHYSIOGRAPHY. Principles of earth sculpture; physiographic changes in progress, and agencies causing them; hydrography and oceanography; planetary relations; climatology; field excursions. POSEY.

35. LABORATORY WORK. A course in the interpretation of topographic maps. Supplements and should accompany Course 29, tho not required in connection with it. Should be taken by those who expect to teach Physiography. POSEY.

## GERMAN

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor CARL SCHLENKER; Assistant Professors OSCAR C. BURKHARD, WALTER R. MYERS; Instructors JAMES DAVIES, J. THEODORE GEISSENDOERFER, ARTHUR R. GRAVES, ALFRED E. KOENIG, THEOPHILUS H. SCHROEDEL, HAROLD W. SOULE, RICHARD WISCHKAEMPER; Assistant ARNOLD W. SHUTTER.

COURSES

| No. | Titie | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Beginning | 6 | All | None |
| 2a,b. | Intermediate | 6 | All | 1 |
| 5-6. | Prose and Poetry | *6 | All | 2 yrs. preparatory |
| 7-8. | Drama | *6 | All | 4, 6 or 4 yrs. preparatory |

| | | | | |
|---|---|---|---|---|
| 21-22. | Scientific Intermediate ..... | *6 | All | 1 or equiv. |
| 23-24. | Scientific Advanced ..... | *6 | All | 22, 2 or 4 yrs. preparatory |

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

* Both semesters must be completed before credit is given for the first semester.

INTRODUCTORY COURSES

1a,b. BEGINNING. Double course given each semester as a six-hour course. Pronunciation, grammar, conversation, and composition; selected reading in easy prose and verse. MYERS, DAVIES, GRAVES, KOENIG, SCHROEDEL, SOULE, SHUTTER.

2a,b. INTERMEDIATE. Double course given each semester as six-hour course. Selected texts in modern narrative and descriptive prose; selected lyrics and ballads; a drama of Lessing, Goethe, or Schiller. Assigned readings of texts outside of class. MYERS, DAVIES, GRAVES, KOENIG, SCHROEDEL, SOULE, SHUTTER.

5-6. PROSE AND POETRY. Geography, history, and legend. Review of German grammar throughout the year. BURKHARD, DAVIES, GEISSENDOERFER, SOULE, WISCHKAEMPER.

7-8. DRAMA. First semester: classic drama; plays of Lessing, Goethe, Schiller. Second semester: modern drama; plays of Hebbel, Sudermann, Hauptmann and others. Assigned readings and reports throughout the year. GRAVES.

21-22. SCIENTIFIC INTERMEDIATE. This course aims to give students a reading knowledge of German for use in scientific studies. Not open to those who have obtained credit for either Course 3-4 or 5-6. GEISSENDOERFER.

23-24. SCIENTIFIC ADVANCED. Reading of monographs and periodicals. Not open to those who have obtained credit for Course 7-8. WISCHKAEMPER.

## HUMAN PHYSIOLOGY

### MEDICAL SCHOOL

Professor ELIAS P. LYON; Associate Professor RICHARD O. BEARD.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3a,b. | Elem. Human Physiology ..... | 3 | All | Chem. 1 yr., Biol. ½ yr. |

For additional courses see the bulletin of the Medical School.

INTRODUCTORY COURSES

3a,b. ELEMENTARY HUMAN PHYSIOLOGY. Primarily for Home Economics students and nurses; open to others. Lectures and laboratory work. LYON, BEARD.

## MUSIC

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor CARLYLE SCOTT; Assistant Professor DONALD FERGUSON; Instructors MAXIMILIAN DICK, ABE PEPINSKY, GERTRUDE REEVES.

*General statement.*—Credit is offered to seniors and juniors in the College of Agriculture who may wish to elect work in the Department of Music in the College of Science, Literature, and the Arts. Six credits may be obtained. The following courses are recommended:

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Harmony | 3 | Jr., sr. | None |
| 13-14. | Pianoforte | 4 | Jr., sr. | See statement |
| 15-16. | Violin | 4 | Jr., sr. | See statement |
| 23-24. | Chorus | 1 | Jr., sr. | None |
| 25-26. | Orchestra | 1 | Jr., sr. | None |

1-2. HARMONY. The study of chords, their construction, relations, and progressions. Written exercises on basses, the harmonization of given melodies. SCOTT.

13-14. PIANOFORTE. Open to juniors who have mastered technical difficulties of the degree of Czerny's *School of Velocity* and the easier Haydn and Mozart sonatas. The fee is thirty-two or sixty-four dollars a semester. SCOTT, FERGUSON, REEVES.

15-16. VIOLIN. Candidate must be able to play the first ten of Kreutzer's forty etudes, and the easier Handel and Mozart sonatas. DICK, PEPINSKY.

23-24. CHORUS. A popular course in choral practice for four-part mixed voices. SCOTT.

25-26. ORCHESTRA. FERGUSON, PEPINSKY.

## PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

### MEDICAL SCHOOL

Professor HAROLD E. ROBERTSON; Associate Professor WINFORD P. LARSON; Instructors ARTHUR T. HENRICI, ANNE BENTON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Course* | | | |
| 58. | General Bacteriology | 3 | Soph. | Biol. 1 yr. |

**For additional courses see the bulletin of the Medical School.**

58. BACTERIOLOGY. General scope of bacteriology. Preparation of culture media. Morphological and biological character of bacteria. Methods of identification, sterilization, and disinfection. Bacteriology of water, milk, and air. Application of bacteriology to agricultural and industrial pursuits. LARSON, HENRICI, BENTON.

# PHILOSOPHY AND PSYCHOLOGY

## COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor NORMAN WILDE; Associate Professor DAVID F. SWENSON; Assistant Professors HERBERT WOODROW, RUPERT C. LODGE; Instructor AUSTIN S. EDWARDS; Lecturer JOSEPH PETERSON.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1-2. | General Psychology | 6 | Soph., jr., sr. | None |
| 5a,b. | Elements of Psychology | 3 | Soph., jr., sr. | None |
| 9a,b. | Logic | 3 | Soph., jr., sr. | None |
| | *Continuation Courses* | | | |
| 13. | Introduction to Philosophy | 3 | Jr., sr. | 3 cred. |
| 17. | Methods of Study | 3 | Jr., sr. | 5 or 1-2 |
| 51a,b. | Ethics | 3 | Jr., sr. | 6 cred. |
| 56. | Esthetics | 3 | Jr., sr. | 6 cred. |
| 57. | Social Psychology | 3 | Jr., sr. | 6 cred. incl. 5 or 1-2 |
| 60. | Child Development | 3 | Jr., sr. | 3 cred. |
| 65. | Philosophy of Religion | 3 | Jr., sr. | 6 cred. |

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

### INTRODUCTORY COURSES

1-2. GENERAL PSYCHOLOGY. The aims and methods of psychology; the facts, laws and functions of mental life; development and learning in relation to training and instinct. Required for a teacher's certificate. WOODROW, PETERSON, EDWARDS.

5a,b. ELEMENTS OF PSYCHOLOGY. A brief outline for those who do not intend to take further work in psychology. Together with Course 9 a satisfactory introduction to the philosophical courses of the junior year. SWENSON, LODGE.

9a,b. LOGIC. The nature of knowledge, the laws of reasoning, the principles and methods of scientific proof. Together with Course 5 a satisfactory introduction to the philosophical courses of the junior year. WILDE, SWENSON, LODGE.

### CONTINUATION COURSES

13. INTRODUCTION TO PHILOSOPHY. The aim, method, and chief problems of philosophy. LODGE.

17. METHODS OF STUDY. Some results of modern psychology in their application to the problems of the learner; ways of avoiding and overcoming obstacles in study. EDWARDS.

51a,b. ETHICS. The principles of morals; sketch of the historical development of morality followed by an analysis of its meaning, and of its basis in human nature. WILDE.

56. ESTHETICS. An introduction to the history and theory of esthetics, psychological analysis of beauty, and a discussion of the arts. SWENSON.

57. SOCIAL PSYCHOLOGY. The instinctive and acquired factors in the behavior of the individual toward society in its various forms and groupings, and in the growth of ideas of self and of social attitudes. PETERSON.

60. CHILD DEVELOPMENT. A study of the stages of development from infancy through adolescence for those interested in parenthood and education. EDWARDS.

65. PHILOSOPHY OF RELIGION. The development of the idea of God from its simplest beginnings, the changes undergone in Greek, Jewish, and Christian thought; its validity in view of modern scientific theories. SWENSON.

## PHYSICAL EDUCATION FOR WOMEN

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Assistant Professor J. ANNA NORRIS; Instructors MAY S. KISSOCK, VALERIA LADD, ALICE H. TOLG.

*General statement.*—This department aims to look after the health of the women students. It gives physical examination and advice to all newly entering students; and endeavors systematically to keep in close touch with them during their first year in college; conducts consultations with and examines when necessary, all upper class students; gives courses in hygiene; organizes physical work to meet the various needs and physical tastes of students; coöperates closely with the Woman'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 and 11), and of all students permitted, for reasons connected with their physical condition, to carry less than the minimum number of credit hours. Physical examinations or consultations required annually of all students.

Elective work without credit arranged in social dancing, gymnastic dancing, swimming, fencing, basketball, baseball, skating, etc.

Professional courses 15-16, 17-18, for those who desire to teach Physical Education will be offered for the first time in 1916-17.

A new gymnasium building, finished in 1916, affords adequate space and equipment for all activities.

See page 82 for Physical Training on Agricultural College Campus.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1-2. | Elementary Physical Training..... | .. | All. Required of all new students* | None |
| 3-4. | Intermediate Physical Training.... | 3 | Soph., jr., sr. | 1-2 or equiv. |
| 5-6. | Advanced Physical Training..... | 3 | Jr., sr. | 3-4 |
| 11. | Preliminary Hygiene ..... | .. | Required of all new students | None |
| 13. | Personal Hygiene ..... | 3 | Jr., sr. | Animal Biology 1-2 |
| 14. | Hygiene of the Family..... | 3 | Jr., sr. | 13 |
| 15-16. | Principles of Physical Education... | 6 | Jr., sr. | None |
| 17-18. | Practice Teaching ..... | 6 | Jr., sr. | 1-2, 3-4, 21-22 |

Six credits is the maximum number that can be gained by taking courses in exercise in this department (courses 3-4, 5-6) and in Physical Training, Agricultural College Campus; only one of these courses may be taken for credit in a semester.

* Students entering with advanced standing may postpone this course in case of conflict. It must be completed, however, before graduation.

## INTRODUCTORY COURSES

1-2. Elementary Physical Training. Lighter gymnastics; dances; games; swimming. Study of habits of daily living. Divided into sections according to physical capacity. Girls who can not swim at end of freshman year required to register for swimming in sophomore year. Kissock, Tolg, Ladd.

3-4. Intermediate Physical Training. Advanced gymnastics, gymnastic dances, and organized team games. Includes study of daily habits of living and written abstract of one book each semester. If taken for no credit no reading or written work is required. Kissock.

5-6. Advanced Physical Training. Advanced gymnastics and an election of dancing, fencing, or a sport. Includes a study of the daily habits of living and a written abstract of one book a semester. If taken for no credit no written work or reading will be required. Ladd.

11. Preliminary Hygiene. Twelve lectures. The most essential aspects of the care of the body. Norris.

13. Personal Hygiene. The essential knowledge of the care of the body, including a brief consideration of its anatomy and a study of its physiology, the prevention of contagious diseases, and first aid to the injured. Norris.

14. Hygiene of the Family. A study of maternity and infancy and the essentials of home nursing. Norris.

15-16. Principles of Physical Education. A study of the character, purpose, arrangement, and progression of developmental and corrective gymnastics, games and dancing; physical examinations and first

aid to the injured. Intended for students preparing to teach Physcial Education. KISSOCK, TOLG, LADD.

17-18. PRACTICE TEACHING. The preparation and teaching of lessons in developmental and corrective gymnastics, games and dancing, within the class group. Gymnasium suits required. KISSOCK, TOLG, LADD.

## PHYSICS

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors HENRY A. ERIKSON, ANTHONY ZELENY; Assistant Professor LOUIS W. MCKEEHAN; Instructors ERNEST O. DIETERICH, PAUL E. KLOPSTEG.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Physics | 3 | Soph., jr., sr. | Agr. Eng. 1, 2 or registration in Agr. Eng. 1 or 2 |
| 2. | General Physics | 3 | Soph., jr., sr. | 1 |
| 3. | General Laboratory Practice | 1 | Soph., jr., sr. | See statement |
| 4. | General Laboratory Practice | 1 | Soph., jr., sr. | See statement |
| 5-6. | General Physics (Col. of Agr.) | 6* | Soph., jr., sr. | None |
| 17-18. | General Physics (Home Econ.) | 6* | Fr. | None |

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

* Both semesters must be completed before credit is given.

### INTRODUCTORY COURSES

1. GENERAL PHYSICS. Mechanics of solids and fluids, sound, heat. Treatment experimental rather than mathematical; the fundamental principles. First part of a general course 1-2. Should be taken in conjunction with Course 3. ZELENY, KLOPSTEG, DIETERICH.

2. GENERAL PHYSICS. Light, electricity, magnetism. Treatment experimental; fundamental principles, including radioactivity, ionization, X-radiation, and electrical constitution of matter. Second part of general course 1-2. Should be taken in conjunction with Course 4, but may be taken separately. ZELENY, KLOPSTEG, DIETERICH.

3. GENERAL LABORATORY PRACTICE. Physical measurements in the mechanics of solids, fluids, sound, heat, giving students knowledge of experimental methods, and acquaintance with the fundamental facts. Open to all who have completed or are taking Course 1. MCKEEHAN, DIETERICH.

4. GENERAL LABORATORY PRACTICE. Physical measurements in light, electricity, and magnetism. Open to all who have completed or are taking Course 2, and have completed Course 3. MCKEEHAN, DIETERICH.

5-6. GENERAL PHYSICS. Mechanics of solids and fluids, sound, heat, light, electricity, and magnetism. Treatment experimental; the fundamental principles. Open to students registered in the College of Agriculture. ZELENY, KLOPSTEG, DIETERICH.

17-18. GENERAL PHYSICS. Mechanics of solids and fluids, sound, heat, light, electricity, and magnetism. Treatment experimental with special emphasis on applications to the household. Open to students in Home Economics. KLOPSTEG.

## POLITICAL SCIENCE

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors WILLIAM A. SCHAPER, CEPHAS D. ALLIN; Instructor WILLIAM ANDERSON; Assistant PERCIVAL W. VIESSELMAN.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | American Government | 3 | Soph., jr., sr. | None |
| 5. | European Municipal Administration | 3 | Soph., jr., sr. | None |
| 6. | American Municipal Administration | 3 | Soph., jr., sr. | 1 |
| 7a,b. | State and Local Government | 3 | Soph., jr., sr. | 1 |
| 51. | Business Law | 2 | Sr. | 1 or Econ. 3 |

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

INTRODUCTORY COURSES

1a,b. AMERICAN GOVERNMENT. Organization and actual workings of the national government; nature and origin of the American governmental system. SCHAPER, ALLIN, ANDERSON, VIESSELMAN.

5. EUROPEAN MUNICIPAL ADMINISTRATION. A study of French, German, Austrian, and English cities; the forms of government, parties, and elections; achievements in finance, police, sanitation, city planning and other public services undertaken. SCHAPER.

5. AMERICAN MUNICIPAL ADMINISTRATION. A study of the organization and chief functions of American cities; their growth, relation to the state, forms of charters, inefficiency, and corruption, reform measures; and the administration of finance, police, health, and other activities. SCHAPER.

7a,b. STATE AND LOCAL GOVERNMENT. Comparison of American state governments, especially Minnesota; relation of states to the United States and to local units of government; recent experiments such as initiative and referendum, the recall and primaries; social and economic legislation. ANDERSON, VIESSELMAN.

51. BUSINESS LAW. The principles of law governing ordinary business transactions. This course will deal with the general law of contracts, including sales, bankruptcy, and agency. VIESSELMAN.

## ROMANCE LANGUAGES

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors EVERETT WARD OLMSTED, COLBERT SEARLES; Assistant Professors JULES T. FRELIN, RUTH S. PHELPS; Professorial Lecturer PEDRO HENRIQUEZ UREÑA; Instructors HARRY E. ATWOOD, FRANCIS H. BARTON, NELSON F. COBURN, WILLIS J. PLUMMER, EDWARD H. SIRICH.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Beginning French | 6 | All | None |
| 2a,b. | Beginning French | 3 | All | Prep. French 1 yr. |
| 3a,b. | Intermediate French | 6 | All | 1 or equiv. |
| 4. | Survey of French Literature | 6 | All | 1 or equiv. |
| 5-6. | Survey of French Literature | 6 | All | 3 or equiv. |
| 7-8. | Elemen. French Conversation | 2 | All | 3 or equiv. |
| 9-10. | Elemen. French Composition | 1 | All | 3 or equiv. |
| 31a,b. | Beginning Spanish | 6 | All | None |
| 33-34. | Beginning Spanish | 6 | All | None |
| 35a,b. | Intermediate Spanish | 6 | All | 31 or equiv. |
| 37-38. | Intermediate Spanish | 6 | All | 31 or equiv. |
| 39-40. | Spanish Literature of the Nineteenth Century | 6 | All | 35 or equiv. |
| 41-42. | Elementary Spanish Conversation | 2 | All | 35 or equiv. |
| 43-44. | Elementary Spanish Composition | 2 | All | 35 or equiv. |

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

### INTRODUCTORY COURSES

1a,b. BEGINNING FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar, drill, oral exercises and translation. SEARLES, FRELIN, ATWOOD, BARTON, COBURN, SIRICH.

2a,b. BEGINNING FRENCH. Semester course. For those who have completed one year of preparatory French. BARTON.

3a,b. INTERMEDIATE FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and reading, representative authors of the Nineteenth Century. FRELIN, ATWOOD.

4. SURVEY OF FRENCH LITERATURE. Double course. Same as 5-6. BARTON.

5-6. GENERAL SURVEY OF FRENCH LITERATURE. Lectures, recitations, and assigned readings. Designed to cover the whole period in historical outline, and to prepare for a more minute study of special periods. Selections from representative authors. PHELPS, ATWOOD, SIRICH.

7-8. ELEMENTARY FRENCH CONVERSATION. Small amount of outside preparation will be required. The section meeting at nine o'clock on Mon-

day, Wednesday, and Friday is limited to students taking Course 5-6 and is based on the work of that course. FRELIN, BARTON, SIRICH.

9-10. ELEMENTARY FRENCH COMPOSITION. FRELIN, BARTON.

31a,b. BEGINNING SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar drill, oral exercises, and translation. UREÑA, PLUMMER.

33-34. BEGINNING SPANISH. This course is the same as Course 31 except that it is a year-course. OLMSTEAD, COBURN, PLUMMER.

35a,b. INTERMEDIATE SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and reading. UREÑA, PLUMMER.

37-38. INTERMEDIATE SPANISH. This course is the same as course 35a,b, except that it is a year-course. UREÑA, COBURN.

39-40. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Lectures, recitations, and assigned readings. UREÑA.

41-42. ELEMENTARY SPANISH CONVERSATION. A small amount of outside preparation required. The life and customs of modern Spain; accompanied by illustrative material. PLUMMER.

43-44. ELEMENTARY SPANISH COMPOSITION. Special attention given to social and commercial correspondence. PLUMMER.

## SOCIOLOGY AND ANTHROPOLOGY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor ALBERT ERNEST JENKS.

*General statement.*—Modern University education is not complete unless the graduate has obtained the social point of view. To this end the Department offers elementary courses dealing with peoples, with social forces, institutions, and movements. Its more advanced courses are designed especially for students majoring in the Social Sciences, namely: Economics, History, Political Science, and Sociology and Anthropology.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | General Introduction ..... | 3 | Soph., jr., sr. | None |

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

### INTRODUCTORY COURSES

1a,b. GENERAL INTRODUCTION. Elemental activities, institutions, laws, and theories. Especial emphasis is placed on descriptive data. Text book and lectures. JENKS,* NEERGAARD, TODD.*

* First semester only.

# COURSES OF STUDY

## HOME ECONOMICS

The following courses of study are designed (a) to prepare women for the responsibilities of citizenship, and of home-making; (b) to prepare teachers for the extension of Home Economics education. They are planned to meet the needs of three groups of young women:

1. Students electing to major in Home Economics as a type of General Arts education for women.

2. Students preparing for teaching in the general field of Home Economics.

3. Students preparing for teaching in the special field of Home Economics, viz., Textiles and Clothing.

Upon the completion of the prescribed courses and the electives provided for in one of the following schedules, in all 132 (136 for the class graduating in 1917) credit hours, the candidate is recommended for graduation with the degree of Bachelor of Science (Home Economics).

Descriptions of the courses in Home Economics are given on pages 78 to 81. Required courses given by other divisions are described on pages 31 to 73. Electives may be chosen from these groups or from courses for which the student has the necessary prerequisites offered in other colleges.

The courses required for the freshman year are the same in each course of study. Some differentiation appears in the sophomore year. Specialization is provided for in the junior and senior years.

## GENERAL REQUIREMENTS FOR ALL STUDENTS IN HOME ECONOMICS

For explanation of course numbers and credits see page 20.

### FRESHMAN YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Rhet. 1, Rhetoric, 3 | Rhet. 2, Rhetoric, 3 |
| An. Biol. 9, General Zoology, 3 | An. Biol. 10, General Zoology, 3 |
| *Chem. 33, General Chemistry and Qualitative Analysis, 5 | Chem. 4b, Advanced General Chemistry and Qualitative Analysis, 3 |
| or | H. E. 1b, Textiles, 2 |
| Chem. 3a, Advanced General Chemistry and Qualitative Analysis, 3 | or |
| and | †H E. 11b, Garment Making, 3 |
| H. E. 1a, Textiles, 2 | or |
| or | H. E. 51b, Drawing and Design, 3 |
| H. E. 51a, Drawing and Design, 3 | ‡Phys. 18, General Physics, 3 |
| or | or |
| †H. E. 11a, Garment Making, 3 | §Econ. 1b, Industrial History since 1750, 3 |
| | or |

* Students not offering Chemistry (one unit) for entrance must register for this course. One additional credit must be completed before graduation.

‡Phys. 17, General Physics, 3
§Econ. 2a, Industries and Commerce of the United States, 3
or
§Agr. Eng. 3a, Mechanical Drawing, 3
Phys. Ed. 1, Elementary Physical Training
‡‡Phys. Ed. 11, Preliminary Hygiene
**Freshman Lectures

§Agr. Eng. 3b, Mechanical Drawing, 3
Phys. Ed. 2, Elementary Physical Training
‡‡Survey Talks

† Students offering approved Domestic Art for entrance may substitute for H. E. 11.

‡ For those not presenting Physics for entrance.

§ Students offering Physics (one unit) for entrance will enroll for Industrial History, or Industries and Commerce of the United States, or Mechanical Drawing.

‡‡ All freshmen are required to attend a course of lectures on Hygiene and a course of general Survey Talks on aims and methods in Home Economics.

** A course of lectures intended primarily to familiarize the new student with the college, college customs and methods of procedure is required of all freshmen.

### SOPHOMORE YEAR

*First Semester*

‡H. E. 23a, Foods and Cookery, 5
or
H. E. 21a, Foods and Cookery, 3
and
*Agr. Chem. 3a, Types of Carbon Compounds, 3
Physiol. 3a, Elementary Human Physiology, 3
Sociol. 1a, General Introduction, 3
H. E. 13a, Dressmaking, 3
or
Agr. Chem. 2a, Quantitative Methods, 3
†Engl. Elective, 3

*Second Semester*

H. E. 22b, Food Economics, 3
Path. 58, Bacteriology, 3
Psych. 5b, Elements, 3
Rhet. 11b, Argumentation, 3
†Agr. Chem. 3b, Types of Carbon Compounds, 3
or
Agr. Chem. 2b, Quantitative Methods, 3
or
H. E. 13b, Dressmaking, 3
Elective, 2

* Students specializing in the Teachers Course in Textiles and Clothing may substitute three elective credits for Agr. Chem. 3.

† Students not offering Domestic Science (one unit) for entrance will register for H.E. 23, Foods and Cookery 5 and postpone Engl. Elective to the junior year.

‡ Students registering for this course must complete one credit in addition to the number shown in the schedule for graduation.

## SPECIAL REQUIREMENTS FOR THE DIFFERENT COURSES OF STUDY

### GENERAL COURSE IN HOME ECONOMICS

### JUNIOR YEAR

*First Semester*

H. E. 101, Nutrition, 5
H. E. 33, Home Care of the Sick, 1
H. E. 53a, Historic Ornament and Advanced Design, 3
or
Econ. 3a, Principles of Economics, 3
Elective, 8

*Second Semester*

H. E. 102, Nutrition, 5
H. E. 53b, Historic Ornament and Advanced Design, 3
or
Econ. 3b, Principles of Economics, 3
Elective, 9

## SENIOR YEAR

*First Semester*

H. E. 103a, Dietetics, 3
or
H. E. 17a, Clothing Economics, 3
{ H. E. 34a, Home Management: Operation and Maintenance, Lectures, 2
and
H. E. 35a, Home Management: Operation and Maintenance, Laboratory, 3 }
or
H. E. 32a, Home Management: House Planning and Equipment, 3
Elective, 9 or 11
Public Health Lectures

*Second Semester*

H. E. 103b, Dietetics, 3
or
H. E. 17b, Clothing Economics, 3
{ H. E. 34b, Home Management: Operation and Maintenance, Lectures, 2
and
H. E. 35b, Home Management: Operation and Maintenance, Laboratory, 3 }
or
H. E. 32b, Home Management: House Planning and Equipment, 3
Elective, 8 or 10

## TEACHERS' COURSE IN HOME ECONOMICS

### JUNIOR YEAR

*First Semester*

H. E. 101, Nutrition, 5
H. E. 33, Home Care of the Sick, 1
H. E. 53a, Historic Ornament and Advanced Design, 3
or
Econ. 3a, Principles of Economics, 3
Agr. Ed. 11a, Principles of Industrial Education, 3
Elective, 5

*Second Semester*

H. E. 102, Nutrition, 5
H. E. 42, Home Economics Education, 3
H. E. 53b, Historic Ornament and Advanced Design, 3
or
Econ. 3b, Principles of Economics, 3
Ed. 1b, History of Education, 3
Elective, 3

### SENIOR YEAR

*First Semester*

H. E. 103a, Dietetics, 3
or
H. E. 17a, Clothing Economics, 3
{ H. E. 34a, Home Management: Operation and Maintenance, Lectures, 2
and
H. E. 35a, Home Management: Operation and Maintenance, Laboratory, 3 }
or
H. E. 32a, Home Management: House Planning and Equipment, 3
H. E. 45, Home Economics Education, 1
{ H. E. 47, Observation and Teaching, 3
H. E. 48a, Observation and Teaching, 3 } 5*
Elective, 3 or 5
Public Health Lectures

*Second Semester*

H. E. 103b, Dietetics, 3
or
H. E. 17b, Clothing Economics, 3
{ H. E. 34b, Home Management: Operation and Maintenance, Lectures, 2
and
H. E. 35b, Home Management: Operation and Maintenance, Laboratory, 3 }
or
H. E. 32b, Home Management: House Planning and Equipment, 3
H. E. 46, Home Economics Education, 1
Elective, 7 or 9

* These two courses duplicate subject matter in part. Students taking both courses are entitled to not more than five credits.

## TEACHERS' COURSE IN TEXTILES AND CLOTHING

### JUNIOR YEAR

*First Semester*

H. E. 53a, Historic Ornament and Advanced Design, 3
or
Econ. 3a, Principles of Economics, 3
H. E. 55a, Decorative Needlework and Crafts, 2
Agr. Ed. 11a, Principles of Industrial Education, 3
H. E. 33, Home Care of the Sick, 1
Elective, 8

*Second Semester*

H. E. 53b, Historic Ornament and Advanced Design, 3
or
Econ. 3b, Principles of Economics, 3
H. E. 4b, Advanced Textiles, 3
H. E. 44, Organization and Methods for Textiles and Clothing, 3
H. E. 16, Tailoring, 2
Ed. 1b, History of Education, 3
Elective, 3

### SENIOR YEAR

*First Semester*

H. E. 17a, Clothing Economics, 3
H. E. 45, Home Economics Education, 1
H. E. 48a, Observation and Teaching, 3
Elective, 10
Public Health Lectures

*Second Semester*

H. E. 18, Commercial Clothing Manufacture, 3
H. E. 32b, Home Management: House Planning and Equipment, 3
Elective, 10

# DESCRIPTION OF COURSES

For explanation of course numbers and credits see page 20.

## HOME ECONOMICS

Professor JOSEPHINE T. BERRY; Assistant Professors ALICE BIESTER, HARRIET GOLDSTEIN, MABEL BARBARA TRILLING, MARION WELLER, LUCILE WHEELER, GRACE I. WILLIAMS; Instructors ANNA E. BAYHA, BESSIE E. BEMIS, CARLOTTA BROWN, HALLY J. FISHER, VETTA GOLDSTEIN, AMY P. MORSE, ETHEL L. PHELPS, ELIZABETH VERMILYE; Lecturer MARTHA B. MOORHEAD; Extension Specialists MARY L. BULL, BESS M. ROWE, JUNIATA L. SHEPPERD.

*General statement.*—The following courses are planned primarily for students majoring in Home Economics, and are required in the courses of study in Home Economics, see schedule, pages 74 to 77. They are open for election to students in other courses who offer the prerequisites as stated below.

Requirements for the Industrial Certificate.—The Industrial Certificate is granted to graduates of the Teachers' Courses in Home Economics and Textiles and Clothing who have completed the prescribed professional courses, and who are recommended for the certificate by the Division of Home Economics.

Special attention is called to the prerequisites for courses 47 and 48a required for the Teacher's Certificate. No student is admitted to course 47 who has a grade below C (81-87) in courses 21, 23, 22, 42, or 101. No student is admitted to course 48a who has a grade below C in courses 1, 11, 13, 42, or 44.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Textiles | 2 | Fr. | None |
| 4a,b. | Advanced Textiles | 3 | Jr. | 1, 51 |
| 11a,b. | Garment Making | 3 | Fr. | None |
| 13a,b. | Dressmaking | 3 | Jr. | 1, 11 |
| 16. | Tailoring | 2 | Jr. | 13 |
| 17a,b. | Clothing Economics | 3 | Sr. | 13, 53 |
| 18. | Commercial Clothing Manufacture | 3 | Sr. | 17 |
| 19a,b. | Millinery | 1 | Soph.,jr.,sr. | 11, 51 |
| 21a,b. | Foods and Cookery | 3 | Soph. | H. S. Do. Sci. 1 unit; Chem. 3 or 33; Physiol. 3, parallel |
| 22a,b. | Food Economics | 3 | Soph. | 21 |
| 23a,b. | Foods and Cookery | 5 | Soph. | Chem. 3 or 33; Physiol. 3, parallel |
| 24. | Camp Cookery | 1 | Fr. | None |
| 32a,b. | Home Management: House Planning and Equipment | 3 | Sr. | 51 |

| | | | |
|---|---|---|---|
| 33. Home Care of the Sick..... | 1 | Jr. | Chem. 3 or. 33; Path. 58 |
| 34a,b. Home Management: Operation and Maintenance, Lectures.... | 2 | Sr. | 22 |
| 35a,b. Home Management: Operation and Maintenance, Laboratory.. | 3 | Sr. | 22 |
| †42. Home Economics Education ..... | 3 | Jr. | 22, Psychol. 5b |
| †44. Organization and Methods for Textiles and Clothing ..... | 3 | Jr. | 13, Psychol. 5b |
| †45. Home Economics Education..... | 1 | Sr. | 42 |
| †46. Home Economics Education..... | 1 | Sr. | 45 |
| †47. Observation and Teaching..... | 3* | Sr. | 42; see general statement above |
| †48a. Observation and Teaching..... | 3* | Sr. | 42; see general statement above |
| 51a,b. Drawing and Design..... | 3 | Fr. | None |
| 53a,b. Historic Ornament and Advanced Design ..... | 3 | Jr. | 51 |
| 55a,b. Decorative Needlework and Crafts | 2 | Jr. | 1, 11, 51 |
| *Advanced Courses* | | | |
| 101. Nutrition ..... | 5 | Jr. | 22, Agr. Chem. 2, Path. 58; parallel Agr. Chem. 3 |
| 102. Nutrition ..... ..... | 5 | Jr. | 101 |
| 103a,b. Dietetics ..... | 3 | Sr. | 102 |

* Students completing both 47 and 48a are entitled to not more than five credits.

† College of Education.

## INTRODUCTORY COURSES

1a,b. TEXTILES. A study of textile fibers, their structure, properties, and chemical reactions; of fabrics, their structure and processes of manufacture; of art and economic considerations in selection and purchase of materials for clothing and household furnishing. WELLER, TRILLING, PHELPS.

4a,b. ADVANCED TEXTILES. A more intensive study of textile fibers and fabrics; organization of laboratory problems leading to the establishment of a basis for standardization by the general consumer and for a demand for pure textiles. WELLER.

11a,b. GARMENT MAKING. Instruction and laboratory practice in hand sewing; in the reading and adaptation of commercial patterns; in the construction and use of the sewing machine; in designing, cutting, and making simple outer garments from washable materials. PHELPS, BAYHA.

13a,b. DRESSMAKING. Consideration of quality, suitability and cost of materials adapted to technique involved in construction of simple wool and silk dresses; adaptation of art principles in selection of designs; instruction and practice in methods of construction. TRILLING, BAYHA.

16. TAILORING. The technique and methods of construction employed in the making of tailored suits and wraps. Not offered in 1916-1917.

17a,b. CLOTHING ECONOMICS. General consideration of economic function of woman; history of woman's place in home and industry with reference to clothing and textiles; study of clothing budgets, hygiene and standardization of dress. Laboratory problem in costume modeling. WELLER.

18. COMMERCIAL CLOTHING MANUFACTURE. A study of the organization of the clothing trades and industries; of wages and standards of efficiency in workmanship. Laboratory practice upon a commercial basis, measured by trade standards. Not offered in 1916-17. WELLER.

19a,b. MILLINERY. A study of the processes and materials used in millinery; designing, making, and trimming hats. BROWN.

21a,b. FOODS AND COOKERY. (a) Production, manufacture, chemical composition of typical foods; their classification into food principles; changes in digestion; function in nutrition. (b) Fundamental science principles from chemistry, physics, biology, bacteriology, and their application in typical cookery processes. WHEELER, WILLIAMS, BEMIS, VERMILYE.

22a,b. FOOD ECONOMICS. Cost and nutritive value of typical foods; the study of dietaries; preparation and serving of meals, the cost bearing a definite relation to the family budget. WHEELER, WILLIAMS, BEMIS, VERMILYE.

23a,b. FOODS AND COOKERY. A course following the same general outline as 21a, but including a more detailed study of each topic. WHEELER, WILLIAMS, BEMIS, VERMILYE.

24. CAMP COOKERY. This course is designed to give prospective foresters, engineers, and others a knowledge of the simpler cookery processes; and of such adaptations as are practicable in the several types of out-of-doors camps. BEMIS.

32a,b. HOME MANAGEMENT: HOUSE PLANNING AND EQUIPMENT. Problems in house planning, house furnishing and equipment for various sums. Types of domestic architecture; choice of site; floor-plans; building materials; details of construction; heating; ventilating; lighting; plumbing; walls; rugs; furniture; color; hangings; pictures; gardens. MORSE.

33. HOME CARE OF THE SICK. (a) First aid; communicable diseases; their transmission and prevention; hygiene of infancy, maidenhood, maturity. (b) The care of the sick room; observation and care of the patient; elementary symptomatology. MOORHEAD, FISHER.

34a,b. HOME MANAGEMENT: OPERATION AND MAINTENANCE, LECTURES. The family budget for varying incomes, and for the "Home Management House"; household accounts. BERRY, WILLIAMS, BEMIS.

35a,b. HOME MANAGEMENT: OPERATION AND MAINTENANCE, LABORATORY PRACTICE. (a) Nine weeks' experience as manager and helper in a

household of twenty members. (b) A dietary study covering a period of one month in the above household. BERRY, WILLIAMS, BEMIS.

42. HOME ECONOMICS EDUCATION. Curricula, equipment, methods of teaching for Home Economics. BERRY.

44. ORGANIZATION AND METHODS. Organization of subject content, and methods of teaching for Textiles and Clothing. WELLER.

45. HOME ECONOMICS EDUCATION. Continuation of Course 42. BERRY.

46. HOME ECONOMICS EDUCATION. Continuation of Course 45. BERRY.

47. OBSERVATION AND TEACHING. Observation of teaching in regular classes; criticism and discussion of class practice, lesson plans, methods, results, and examinations; preparation of lesson plans, and directed teaching of foods and cookery, and home management. WILLIAMS.

48a. OBSERVATION AND TEACHING. A course similar to Course 47, but dealing with the teaching of textiles and clothing. TRILLING.

51a,b. DRAWING AND DESIGN. Composition, perspective, color, theory, and color harmonies applied to costume design and interiors; harmony, balance, rhythm, in line and area design. GOLDSTEIN.

53a,b. HISTORIC ORNAMENT AND ADVANCED DESIGN. The historical development of art, architecture, ornament, and furniture, studied with reference to their influence upon modern styles. Problems in decorative design for articles of clothing and for house furnishing. GOLDSTEIN, MORSE.

55a,b. DECORATIVE NEEDLEWORK AND CRAFTS. Applied design in embroidery, lace, stencils, block-printing, applique, as adapted to materials for articles of dress and house furnishings. MORSE.

## ADVANCED COURSES

101. NUTRITION. A study of the chemistry and physiology of metabolism, involving a qualitative examination of the food principles; of the body tissues; of salivary, gastric, and pancreatic digestion. BERRY, BIESTER.

102. NUTRITION. A continuation of Course 101, including the qualitative examination of blood, bile, milk; urine analysis; metabolism experiments. BERRY, BIESTER.

103a,b. DIETETICS. The fundamental principles of human nutrition as applied to the feeding of individuals and groups under conditions of health, and under such pathological conditions as are chiefly dependent upon dietetic treatment. WHEELER.

## PHYSICAL TRAINING

Instructor GRACE E. DENNY.

*General statement.*—A gymnasium fee of $1.50 a semester will be required for each course. This covers the expense of laundering and the wear and tear on equipment, and entitles students to the use of the swimming pool.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3-4. | Intermediate Physical Training..... | 3 | Soph., jr, sr. | 1-2 or equiv. |
| 5-6. | Organized Classes and Graded Folk Dancing ..... | None | All | 1-2 or equiv. |

Six credits is the maximum number that can be gained by taking courses in this group and courses in exercise (3-4, 5-6) offered by the Department of Physical Education for Women. See statement of courses on page 68.

### INTRODUCTORY COURSES

3-4. INTERMEDIATE PHYSICAL TRAINING. Advanced gymnastics, and a choice of aesthetic dancing, swimming, or skating once a week. This course includes field hockey, gymnastics, light and heavy apparatus during the winter and indoor baseball in the spring. DENNY.

5-6. ORGANIZED GAMES AND GRADED FOLK DANCING. Games selected and arranged for use in Public Schools and playgrounds. Graded folk dancing for the same purposes. Ten minutes of each lesson will be given to instruction in teaching and coaching. DENNY.

# Bulletin of The University of Minnesota

# THE LAW SCHOOL

## 1916-1917

VOL. XIX, NO. 7. JULY 1916

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Minneapolis, Minn.

## 1916

### JULY

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## 1917

### JANUARY

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### NOVEMBER

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### DECEMBER

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |

| | | | |
|---|---|---|---|
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 p.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18

# THE LAW SCHOOL

## FACULTY

George Edgar Vincent, Ph.D., LL.D., President — 1005 5th St. S. E.
Cyrus Northrop, LL.D., President, Emeritus — 519 10th Ave. S. E.
William Reynolds Vance, Ph.D., LL.D., Dean and Professor of Law — 525 10th Ave. S. E.

Henry J. Fletcher, LL.M., Professor of Law — 317 17th Ave. S. E.
Ernest G. Lorenzen, Ph.B., LL.B., J.U.D., Professor of Law — 315 11th Ave. S. E.
Edmund Morris Morgan, M.A., LL.B., Professor of Law — 516 9th Ave. S. E.
James Paige, M.A., LL.M., Professor of Law — 420 Oak Grove St.
Edward Sampson Thurston, M.A., LL.B., Professor of Law — 911 5th St. S. E.

Zepherin L. Begin, LL.B., Instructor in Practice — 317 Oak Grove St.

### PROFESSORIAL LECTURERS

Howard S. Abbott, B.L., Minneapolis
Hon. Homer B. Dibell, B.A., LL.B., Commissioner of the Supreme Court of Minnesota
Waldron M. Jerome, B.S., LL.B., Minneapolis
Frederick H. Stinchfield, B.A., LL.B., Minneapolis

### SPECIAL LECTURERS

Hon. Calvin L. Brown, Chief Justice of the Supreme Court of Minnesota
Rome G. Brown, B.A., Minneapolis
Charles W. Bunn, B.S., St. Paul
Arthur L. Helliwell, LL.M., Minneapolis
Hon. Charles S. Jelley, Judge of the District Court, Hennepin County
Frank B. Kellogg, St. Paul
Hugh V. Mercer, LL.M., D.C.L., Minneapolis
Christopher D. O'Brien, St. Paul
Hon. Thomas D. O'Brien, St. Paul, formerly Justice of the Supreme Court of Minnesota

# GENERAL INFORMATION

## OBJECT AND METHOD OF INSTRUCTION

The Law School of the University of Minnesota was established in 1888.

The object of the Law School is to provide a thoro and scientific legal education, and to prepare students for the actual practice of law in any jurisdiction where the English and American legal system prevails. Particular emphasis is laid upon the Minnesota Statutes, the special doctrines of law, and the rules of practice that obtain in this State.

In teaching the various branches of law, the so-called "case system" is employed. This method of teaching law, which has been approved by experience and which is now employed in the leading law schools of the country, has the two-fold merit of enabling the student to acquire a thoro and practical knowledge of legal principles, and to become familiar with those processes of legal reasoning which have determined the form and character of our jurisprudence, and will govern its future development.

The faculty is composed primarily of resident professional law teachers who devote their entire time and energy to teaching. The courses in practice are taught by men experienced in practice at the Minnesota bar. In addition, courses of lectures on special topics are given by distinguished lawyers and judges, selected primarily from the bar of Minnesota.

## ADMISSION

### REGULAR STUDENTS

Candidates for admission to the Law School must have completed at least two years of work in the College of Science, Literature, and the Arts, of the University of Minnesota, or some other college or university of equal grade.* Such candidates may be admitted upon presenting their diplomas or other credentials showing the completion of such college work, to the Registrar of the University.

### SPECIAL STUDENTS

Applicants who are twenty-one years of age and have preliminary education sufficient at least to entitle them to admission to the College of Science, Literature, and the Arts,† may be admitted to the Law School

* This requirement calls for a minimum of fifty-eight credits. The College of Science, Literature, and the Arts, of the University of Minnesota, offers a pre-legal course of two years, containing those subjects which are particularly desirable as a preliminary to the study of law.

† These requirements are stated in full in the current bulletin of the College of Science, Literature, and the Arts.

as special students. Such special students are not candidates for a degree, but in case a special student succeeds in maintaining throughout his course an average grade of *B* or better, the Faculty may by special action recommend him for graduation.

Special students entering with fifty-two academic credits may become regular students by complying with the requirements for admission before the beginning of their second year in the Law School, *provided* they have passed all the subjects required of the first-year law class.

## ADVANCED STANDING

No credit is given for time spent in private reading. The candidate for graduation must spend all three years in residence, either at this law school or at some other accredited law school. A student coming from such other law school must possess the preliminary education required for admission to this school and must spend at least one year in attendance at this law school before he can qualify for a degree. Attorneys-at-law, however, who have been admitted to practice in the State of Minnesota and who have had two years of academic work in college, may enter the third-year law class without examination upon presentation to the Registrar of their certificates of admission to the bar, and shall be entitled to the degree of Bachelor of Laws upon satisfactorily completing such courses, aggregating 24 credits (one year's work), as the Law Faculty may designate.

## REGISTRATION

Students should register on or before the opening of the first semester.* Lectures in all subjects scheduled for the first semester begin promptly on the opening day of the semester, and those who join their classes later will necessarily be seriously handicapped in their work. No student will be admitted to the Law School unless he registers within ten days after the opening of the first semester, except by special action of the faculty and for good cause shown.

No new student will be admitted to the work of the second semester unless he brings from another law school a certificate of advanced standing, showing his qualifications to continue the second semester's work, and unless he registers before the opening of the semester. This is because the more important first-year subjects begin in the fall and are continued throughout the year, and the whole first-year work should be taken as a unit.

## COMBINED SIX-YEAR COURSE LEADING TO DEGREES OF BACHELOR OF ARTS AND BACHELOR OF LAWS

Academic students who have by the end of their junior year completed one major and two minors and have completed courses aggregating

* See page 11 for the provisions as to penalty for late registration.

90 credits, may take during their senior year, the first-year law course, and upon completion of the same will be given the B.A. degree, provided they have attained a total of 118 honor points. Upon completion of the work of the second- and third-year classes in Law, such students will receive the degree of Bachelor of Laws, thus obtaining both degrees in six years.

## PRE-LEGAL COURSES

Students who contemplate studying law are strongly urged to take the combined six-year course described above and thus devote at least three years to collegiate work before entering the Law School. In the opinion of the Law Faculty, it is desirable that a prospective law student, devoting three or more years to collegiate work before undertaking the study of law, should take in his undergraduate years, courses aggregating at least two years of work in each of the following subjects: English Composition (Rhetoric), Latin, a modern language, History (particularly English and American Constitutional History), Mathematics, Economics and Political Science, and courses aggregating at least one year's work in Science, Sociology, Psychology and Logic, and Public Speaking.

## SPECIAL TWO-YEAR PRE-LEGAL COURSE

For those who can not devote more than two years to collegiate work before entering the Law School, the College of Science, Literature, and the Arts offers a special pre-legal course designed to afford special preparation for the study of law. This course is fully set forth in the bulletin of that College.

While students who have completed two years of the regular Academic course offered by the College of Science, Literature, and the Arts in accordance with the regulations of that college, are eligible to enter the Law School, the Law Faculty strongly advises those who enter the College of Science, Literature, and the Arts with the purpose of qualifying for admission to the Law School after two years, to take this special pre-legal course.

## REGULATIONS GOVERNING CLASS WORK, EXAMINATIONS, GRADES, AND PROMOTIONS

Every student registered in the Law School is required to attend with regularity all lectures, whether special or in course, that may be prescribed for his class, to prepare all papers and other class exercises that may be assigned, and to perform all services in connection with the practice court that may be required of him. These requirements apply to all special students as well as to candidates for graduation. Gross delinquency in discharging these requirements may be regarded by the faculty as sufficient reason for requiring the delinquent student to withdraw from the school.

Examinations are held at the end of each semester.

*A, B, C,* and *D* signify passing grades of varying degrees of merit, *A* being the honor mark. *E* signifies a condition and *F* a failure. *I* signifies that the course has not been completed because of illness or a similar reason.

A student who, for any reason, is absent from as many as twenty per cent of the lectures in any course will not receive credit in such course.

A student who fails in a subject must repeat the subject in course.

A student who receives a condition in a subject is entitled to one examination only to remove such condition; and such examination must be taken within one year from the imposition of such condition. On failure successfully to pass such examination, the student must repeat the subject in course.

A student with delinquencies in more than one of the courses required for the preceding year, must register in all subjects in which he is delinquent.

Examinations for the removal of conditions are held during registration week in September each year.

A student having conditions or incompletes in first semester subjects may take an examination in *one* such subject on the day following the Easter recess, *provided* that, prior to the beginning of the Easter recess, he shall have given to the Dean, written notice of his intention to take such examination (stating the subject in question); and, subject to the same requirement as to notice, any candidate for graduation in law or arts in the following June may take two such examinations. Special examinations at any other time will be allowed only upon permission of the faculty and for good cause shown.

A student who is deficient in subjects aggregating eight or more credits (semester hours) will not be promoted to the next higher class. If, in the opinion of the faculty, such student is not qualified either (1) to continue as a student of law, or (2) to take any more advanced work, he may, by vote of the faculty, either (1) be denied the privilege of continuing in the Law School, or (2) be required to repeat the entire work of the preceding year.

A student, who at the end of any semester, fails in two or more subjects taken in that semester may by vote of the faculty be denied the privilege of continuing in the Law School.

Except by special action of the faculty no student will be allowed to enter upon the work of the second semester of his third year as a candidate for a degree at the forthcoming commencement if he lacks more than sixteen credits of the total amount of work required for graduation.

## ELECTIVES IN OTHER DEPARTMENTS OF THE UNIVERSITY

Students in the Law School may be permitted, after completion of the work of the first year, and under proper regulations to elect, without extra charge, courses offered in other departments of the University, pro-

vided that such election does not interfere with their law studies; but such election of courses in other departments may be made only with permission of the Law Faculty. Among the subjects which may be profitably selected are English Composition, English and American Constitutional History, International Law, Public Speaking and Debating, Political Science, Economics, and Sociology. Students who elect such work must complete it in a satisfactory manner or withdraw in good standing before they can obtain the law degree.

## LIBRARIES

The library of the Law School contains more than twenty-four thousand volumes, including all the American Reports, State and Federal (excepting a few reports of inferior state courts), nearly all the English and Canadian Reports, the English, Federal, and State Statutes (with a few exceptions), the standard digests, encyclopedias, legal periodicals and text-books. To this collection substantial additions, particularly in foreign law, are constantly being made. Further library facilities are afforded by the generous action of the Bar Association of Minneapolis in granting to the students the free use of its library located in the Court House. Besides the University and Bar Association libraries, the State Law Library, located at the Capitol in St. Paul, is accessible to students.

## STATE AND UNITED STATES COURTS

The University is located within easy reach of both the Federal and State Courts. The United States Courts are in session in St. Paul and Minneapolis during the greater part of the school year. The Supreme Court of Minnesota, sitting at St. Paul, the District Courts of Ramsey and Hennepin Counties, and the Municipal Courts of St. Paul and Minneapolis are open and in session almost constantly, and afford the student abundant opportunity for witnessing the trial of actual cases and the argument of appeals.

## CASE-BOOKS

The case-books used by the student in his course in the Law School, especially when containing his own annotations, should prove highly valuable to him in after years at the bar. Students are therefore earnestly advised to purchase their own case-books. It has heretofore been the practice, however, for the Law Library to lend case-books for the use of students. This practice will be discontinued after the supply of case-books now on hand has been exhausted.

## TUITION AND OTHER FEES

The tuition fee is sixty-five dollars ($65.00) a year, payable in two equal installments at the beginning of the first and second semesters, respectively.

Students having matriculated in previous years are required to indicate registration on proper blanks not later than September 13. Fees must be paid in full on or before September 20.

For the second semester, registration must be indicated on or before January 24, and fees must be paid on or before January 31.

A penalty fee of one dollar ($1.00) will be charged all students who do not register or pay fees within the time specified, and, after one week, a fee of twenty-five cents per day for each day's delay will be added. The Registrar will send proper blanks to all students who were in attendance the previous year, on or before August 20. Students who fail to receive blanks at that date should call for them.

The regular University fee of $1.00 will be charged to each student taking an examination for the removal of a condition. No other fee will be charged in the Law School for any special examination.

A deposit of five dollars is required of students making use of the case-books belonging to the Law School.

In accordance with a regulation of the Board of Regents, students of all schools and colleges of the University are required to have a box in the University Post-Office, for which a rental charge of fifty cents a year is made.

## EXPENSES

The expense of a student at the University depends largely upon the tastes and habits of the individual. Students can without difficulty obtain board and lodging near the University. Good board can be had for $5.00 per week, and students by clubbing together can usually get board at considerably less expense.

The proximity of the University to two large cities makes it possible for students to earn a portion of their expenses while attending the Law School.

## INQUIRIES

Further particulars as to any phase of the work of the Law School not given herein, or in the Bulletin of General Information, will be cheerfully given upon request. Communications addressed at any time to the Dean of the Law School, the University of Minnesota, Minneapolis, Minnesota, will receive prompt attention.

# COURSE OF STUDY

The curriculum leading to the degree of Bachelor of Laws covers a period of three academic years. To qualify for graduation, a student must complete the entire work of the first and second years and the required work of the third year, together with a sufficient number of electives to aggregate twelve hours of work during each semester of the third year.

Students, unless they be of exceptional ability and industry, who find it necessary to devote a considerable portion of their time and energy to matters not connected with their law studies are strongly advised to limit their work in the law school to not more than ten hours in the class room per week, and thus extend the period of their study of law over four years.

Each regular student, unless excused by special action of the faculty, will be required to take courses aggregating not less than twelve nor more than fifteen hours' work a week during each semester of his first two years, and courses aggregating not less than ten nor more than fifteen hours during each semester of the third year.

In addition to the foregoing, first-year students must brief and argue questions of law assigned. Attendance upon all special lectures scheduled is required of second- and third-year students; and all students in the Law School may be required to serve as jurors or witnesses in any proceedings before the practice court.

All the courses offered by the Law School are given in the day time between the hours of 8 a.m. and 5 p.m.

## FIRST-YEAR COURSES

1-2. CONTRACTS. Offer and acceptance; consideration; contracts under seal; the Statute of Frauds; rights of beneficiaries and assignees; joint and several contracts; conditions; illegality; impossibility; and discharge of contracts. Williston, *Cases on Contracts.* Vols. I and II. First semester, four hours; second semester, four hours. MORGAN.

3-4. TORTS. The general principles underlying the law of civil liability for wrongful conduct, and the specific wrongs of deceit, defamation, malicious prosecution, interference with contracts and trade, etc. Ames and Smith, *Cases on Torts* (edition of 1909-10), Vols. I and II. First semester, three hours; second semester, three hours. VANCE.

5. CRIMINAL LAW AND PROCEDURE. The common and statutory law of crimes; criminal procedure. Mikell, *Cases on Criminal Law and Criminal Procedure.* First semester, three hours. PAIGE.

6. DOMESTIC RELATIONS. Marriage and divorce; parent and child; guardian and ward; property law peculiar to the marriage relation; rights and liabilities of persons under the disabilities of coverture, infancy,

insanity, etc. Paige, *Cases on Domestic Relations.* Second semester, two hours. PAIGE.

7-8. I PROPERTY (1). Real and personal property distinguished; acquisition of title to personal property; accession, confusion; gifts; finding; property rights of bailor and bailee; liens; pledges; fixtures; emblements. Gray, *Cases on Property* (second edition), Vol. I. First semester, three hours. THURSTON.

I PROPERTY (2). Profits; easements; covenants running with the land; licenses; natural rights in the land of another; public ways, and rents. Gray, *Cases on Property* (second edition), Vol. II. Second semester, two hours. THURSTON.

9. CARRIERS AND PUBLIC SERVICE COMPANIES. Origin and development of the law of public callings; common carriers of goods and passengers; telephone, telegraph, gas, electric companies; limitation of liability; state and federal regulation. Green, *Cases on Carriers.* First semester, two hours. FLETCHER.

10. AGENCY. Principal and agent, master and servant—their rights and obligations, mutually and as to third persons. Wambaugh, *Cases on Agency.* Second semester, three hours. LORENZEN.

## SECOND-YEAR COURSES

11-12. PLEADING AND PRACTICE; COMMON LAW PLEADING. Scope of the action, necessary allegations in declaration, and defenses in each form of action at common law; rules governing pleadings in all forms of action at common law. Whittier, *Cases on Common Law Pleading.*

CODE PLEADING. Relation of code pleading to common law pleading; requisites of complaint, answer, demurrer, reply; motions respecting pleadings; amendment; aider; bills of particulars; parties; joinder of causes of action; construction of pleadings. Sunderland, *Cases on Code Pleading.*

PRACTICE. Requisites, service, and return of summons; appearance; change of venue; continuance; the jury; right to open and close; opening statement of counsel; dismissal and directed verdict. Sunderland, *Cases on Trial Practice.* First semester, three hours; second semester, three hours. MORGAN.

13-14. II EQUITY. Nature of equity jurisdiction; injunctions; bills of peace; interpleader; specific performance; bills for account. Ames, *Cases on Equity,* Vols. I and II. First semester, two hours; second semester, three hours. THURSTON.

15-16. EVIDENCE. Nature of evidence; judicial notice; burden of proof; presumptions; admissions; character evidence, confessions, hearsay; opinion evidence; real evidence; writings; parol evidence rule; competency, privilege, and examination of witnesses. Thayer, *Cases on*

*Evidence* (second edition). First semester, two hours; second semester, two hours. JEROME.

17-18. II PROPERTY.* Rights with reference to waters; covenants running with the land. Titles and conveyancing, including the modes of conveyance at common law, under the statute of uses, and by statutory grant; the execution of deeds and estates created thereby; covenants for title, and priorities among titles. Gray, *Cases on Property* (second edition) Vol. II. Aigler, *Cases on Property,* Vol. III. First semester, two hours; second semester, two hours. PAIGE, ROME G. BROWN.

19. SALES. Contracts resulting in the transfer of title to personal property, and the special rights and remedies of the buyer and seller. Williston, *Cases on Sales* (second edition). First semester, three hours. LORENZEN.

20. NEGOTIABLE INSTRUMENTS. Formal and essential requirements of negotiable instruments, and the nature of the liability of the respective parties thereto; acceptance; endorsement; transfer; presentment; notice of dishonor; the Negotiable Instruments Law. Colson's Huffcutt, *Cases on Negotiable Instruments.* First semester, two hours. PAIGE.

21. WILLS AND ADMINISTRATION. Historical originals of the law of succession; testamentary capacity; execution, revocation, and republication of wills; descent; probate of wills and administration of estates. Costigan, *Cases on Wills.* Second semester, two hours. PAIGE.

38. INSURANCE. Nature and requisites of the contract; premiums and assessments; insurable interest; concealment; representations and warranties; waiver and estoppel; rights under the policy; beneficiaries, assignees, and creditors; construction of the policy. Vance, *Cases on Insurance.* Second semester, two hours. VANCE.

## THIRD-YEAR COURSES†

25-26. III PRACTICE AND PRACTICE COURT (required). This course deals with the various proceedings in an action from the commencement thereof, through trial and appellate courts, to final satisfaction of judgment, including work in practice court. Sunderland, *Cases on Trial Practice.* First semester, three hours; second semester, two hours. MORGAN, STINCHFIELD. BEGIN.

* After 1916-17 an elective course on Future Interests in Property will be offered to third-year students and, beginning with 1916-17, the course on Conveyancing will be required of second-year students.

† Third-year students are required to complete the courses in Practice, Private Corporations, III Property, and such other of the third-year courses as will aggregate with the above required courses not less than twenty-four credit hours, provided that no student may take less than ten nor more than fifteen hours in either semester of the third year.

27. III PROPERTY* (required). Adverse possession, prescription; conveyancing; covenants for title; estoppel; dedication, etc. Gray, *Cases on Property* (second edition), Vol. III. Second semester, three hours. FLETCHER.

28-45. PRIVATE CORPORATIONS (required). The nature, creation, and citizenship of corporations; *ultra vires* contracts and acts; stock issues; rights and liabilities of stockholders; officers and agents of corporations; rights of creditors. Richards, *Cases on Private Corporations.* First semester, two hours; second semester, two hours. LORENZEN.

29-30. CONSTITUTIONAL LAW.† The nature of the American constitutional system; legislative, executive, and judicial departments; interstate commerce; constitutional limitations; police power; due process of law; taxation; eminent domain, etc. McClain, *Cases on Constitutional Law* (second edition). First semester, two hours; second semester, two hours. FLETCHER, KELLOGG.

31. TRUSTS. Nature and incidents of the trust relationship; methods of creating trusts; rights and obligations of trustee and beneficiary; constructive trusts; charitable trusts. Kenneson, *Cases on Trusts.* First semester, three hours. THURSTON.

32. PARTNERSHIP. The nature and formation of the partnership relation; the rights and liabilities of the partners, both *inter se* and as to third parties. Gilmore, *Cases on Partnership.* Second semester, two hours. PAIGE.

33-34. CONFLICT OF LAWS. The rules applied by courts in enforcing rights acquired under the law of a sister state or a foreign country. Lorenzen, *Conflict of Laws.* First semester, two hours; second semester, two hours. LORENZEN.

35. MORTGAGES. Legal and equitable mortgages of realty and chattels; rights of mortgagor and mortgagee at law and in equity; foreclosure, redemption, extension, assignment, and discharge of mortgages. Dibell, *Cases on Mortgages.* First semester, two hours. DIBELL.

36. EXTRAORDINARY LEGAL REMEDIES. Mandamus; habeas corpus; certiorari; quo warranto; prohibition. Second semester, two hours. DIBELL.

37. SURETYSHIP. The surety distinguished from the guarantor, the guaranty insurer, and the endorser; surety's defenses against creditor; surety's rights to subrogation, indemnity, contribution, and exoneration; creditor's rights to surety's securities. Ames, *Cases on Suretyship.* Second semester, two hours. LORENZEN. (Omitted 1916-1917.)

22. QUASI CONTRACTS. Nature and scope of quasi contracts, benefits voluntarily conferred by mistake, in partial performance of a con-

* See note (*) on page 14.

† Third-year students may elect this course for both semesters or for the first semester only.

tract, in the absence of a contract; benefits conferred under duress; waiver of tort. Thurston, *Cases in Quasi Contract.* Second semester, two hours. THURSTON.

40. DAMAGES. Exemplary damages; nominal damages; direct and consequential damages; elements of injury; functions of court and jury; liquidated damages; entire and prospective damages; limitations of interest; aggravation and mitigation. Special applications. Beale, *Cases on Damages.* First semester, one hour. LORENZEN.

41. BANKRUPTCY. Origin, history, and nature of the bankruptcy law; jurisdiction of the courts; acts of bankruptcy; practice; receivers; claims, preferences; assets, trustees; liens; adverse claimants; summary jurisdiction; crimes, composition, discharge. Selected cases. First semester, one hour. FLETCHER.

42. TAXATION. This course deals only with the legal questions arising in connection with the assessment of property and the levying and collection of taxes. Selected cases. Second semester, one hour. FLETCHER.

44. MUNICIPAL CORPORATIONS. Legislative control; officers and agents; power to incur indebtedness, to pass ordinances, to grant franchises, to levy taxes, to issue securities, to own and operate public utilities; municipal liability for torts. First semester, two hours. ABBOTT.

## WORK IN PRACTICE

Work in practice begins with the first-year class. Its members, in order to acquire facility in looking up authorities and in legal reasoning, are required to brief and argue certain assigned legal questions. Second-year students in connection with the class-work in practice must prepare pleadings and other papers, while members of the third-year class, in addition to class-room instruction in practice, engage in the exercises of the practice court.

The practice court has divisions corresponding to the District Court and Supreme Court of Minnesota. Each student is assigned a number of cases in which he is required to draw all necessary pleadings, to see to the service of process and pleadings, to conduct the trial, to perfect an appeal, and to prepare all papers in the appellate court. In at least one of the cases so assigned, the student must take steps to secure a provisional or extraordinary remedy.

Members of the third-year class are required to serve as assistants in the office of the Legal Aid Bureau, and to be in the office of the Bureau from 1:30 to 5:30 p.m. daily during the periods assigned for such service.

In connection with the Practice Course, examinations will be given at the end of the first and second semesters. The final examination will cover the work of both semesters.

# Bulletin of The University of Minnesota

## THE MEDICAL SCHOOL

## 1916-1917


VOL. XIX, NO. 8, JUNE 1916

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Minneapolis, Minn.

## 1916

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
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| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees. |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |

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| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

# THE MEDICAL SCHOOL

## THE ADMINISTRATIVE BOARD

GEORGE EDGAR VINCENT, Ph.D., LL.D., President
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LOUIS B. BALDWIN, M.D., Superintendent of the University Hospitals
LEONARD G. ROWNTREE, M.D., Chief of the Department of Medicine
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EMIL S. GEIST, M.D., Member-Elect, Representing the Faculty
ROBERT A. HALL, Ph.D., Member-Elect, Representing the Faculty

## FACULTY

GEORGE EDGAR VINCENT, Ph.D., LL.D., President — 1005 5th St. S. E.
CYRUS NORTHROP, LL.D., President, Emeritus — 519 10th Ave. S. E.
AMOS W. ABBOTT, M.D., Emeritus Professor of Gynecology — 1717 Marquette Ave.
EVERTON J. ABBOTT, B.A., M.D., Emeritus Professor of Clinical Medicine — 425 Dayton Ave., St. Paul
JOHN W. BELL, M.D., Emeritus Professor of Clinical Medicine and Physical Diagnosis — 5127 Lake Harriet Blvd.
*CHARLES A. WHEATON, M.D., Emeritus Professor of Surgery
C. EUGENE RIGGS, M.A., M.D., Emeritus Professor of Mental and Nervous Diseases — 10 Crocus Hill, St. Paul
THOMAS S. ROBERTS, M.D., Emeritus Professor of Pediatrics — 2303 Pleasant Ave.

* Deceased

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535 Lowry Bldg., St. Paul

---

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509 E. River Road

MOSES BARRON, B.S., M.D., Assistant Professor of Pathology
763 Holly Ave., St. Paul

RICHARD OLDING BEARD, M.D., Assistant Dean and Secretary and Associate Professor of Physiology University of Minnesota

ELEXIOUS T. BELL, B.S., M.D., Associate Professor of Pathology
979 Fourteenth Ave. S. E.

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4412 Lake Harriet Bvd.

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3525 3d Ave. S.

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ALEXANDER R. COLVIN, M.D., Assistant Professor of Surgery
630 Lowry Bldg., St. Paul

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Auditorium Bldg.

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4401 E. Lake Harriet Blvd.

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942 Lowry Bldg., St. Paul

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525 East River Road

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602 Essex St. S. E.

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ARTHUR S. HAMILTON, B.S., M.D., Professor, in charge of Division of Nervous and Mental Diseases 513 Pillsbury Bldg.

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JOHN B. JOHNSTON, Ph.D., Dean of the College of Science, Literature, and the Arts, and Professor of Comparative Neurology 1115 5th St. S. E.

WINFORD P. LARSON, M.D., Associate Professor of Bacteriology 614 9th Ave. S. E.

ARTHUR A. LAW, M.D., Associate Professor of Surgery 420 Syndicate Bldg.

THOMAS G. LEE, B.S., M.D., Professor of Comparative Anatomy 509 E. River Road

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JOHN S. MACNIE, B.A., M.D., Assistant Professor of Ophthalmology and Oto-Laryngology 506 Donaldson Bldg.

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EVERHART P. HARDING, Ph.D., Associate Professor of Chemistry
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SAMUEL T. FORSYTHE, B.A., M.D., in Department of Ophthalmology and Oto-Laryngology
FLOYD GRAVE, B.S., M.D., in Department of Medicine
GOLDER L. MCWHORTER, B.S., M.D., in Department of Surgery
SETH E. MOORE, LL.B., M.D., in Department of Obstetrics
RALPH EDWIN MORRIS, M.S., M.D., in Department of Medicine
ROOD TAYLOR, M.D., in Department of Pediatrics
HENRY W. WOLTMANN, B.S., M.D., in Division of Mental and Nervous Diseases

## GRADUATE SCHOLARS

HENRY J. FRIESEN, M.D., in Department of Ophthalmology and Oto-Laryngology

## GENERAL INFORMATION

The twenty-ninth annual course of study in the Medical School begins Wednesday, September 27, 1916, and covers a period of nine months. A summer session of six weeks opens June 12, 1916.

## REQUIREMENTS FOR ADMISSION TO THE MEDICAL SCHOOL

(a) Two years of high school Latin, as part of the high school course required for entrance to the College of Science, Literature, and the Arts.*

(b) At least two years, or sixty credits, of prescribed and elective study in the College of Science, Literature, and the Arts of this University or of any other approved institution. The prescribed academic studies preliminary to medicine are: rhetoric, six credits; physics, eight credits; general chemistry and qualitative analysis, or these subjects combined with organic chemistry, twelve credits; zoology, six credits; and a reading knowledge of German. This two or more years of collegiate study leads, upon the satisfactory completion of one or two years of medical study, to the baccalaureate degree in science or in arts.

Students holding the bachelor's degree of any recognized college may submit credentials of practical equivalence in cultural studies, provided an adequate knowledge of biology, chemistry, and physics has been attained, and a reading knowledge of German is demonstrated.

## REGISTRATION

Registration is conducted under general University rules, in the office of the Registrar. Registration is reported to the office of the Dean of the Medical School. Students will interview the Students' Work Committee for classification and arrangement of courses. Students will not be permitted to register later than the tenth day from the opening of the semester, unless exceptional causes of delay are presented and are accepted by the Students' Work Committee.

On account of the present limited capacity of the Medical School, the registration of incoming (third year) classes has been limited to eighty. All applicants for admission will fill out and submit to the Registrar an application form. These applications should be entered so soon as the candidate's entrance requirements are completed. They will not be received later than July 24, 1916. If preparatory work has been done elsewhere than at the University of Minnesota, application must be accompanied by certified credentials of high school and college courses.

* Candidates who offer a reading knowledge of both German and French may be excused, at the discretion of the Students' Work Committee, from one or more years of Latin.

The Students' Work Committee will meet to consider applicants for admission at 9 a.m. June 5, 1916, and at 9 a.m. July 25, 1916. A personal interview is desirable. If this is impossible, recommendations as to personal fitness, preparation, etc., must be submitted, with credentials.

Candidates will be selected with reference (a) to their full compliance with existing requirements; (b) to the quality of their preparatory work; (c) to their general knowledge and (d) to their personal fitness. They will be submitted to competitive examination, at the discretion of the committee, when it is deemed necessary either to establish their fitness or to determine their comparative merits. Such examinations will be held upon the dates given above. They may cover any of the required pre-medical subjects and will include tests of experience and general information.

Existing published requirements for admission to the Medical School will be respected. Holders of the degree of B.A. or B.S. who have covered the required subjects, and those who have successfully completed two or three years of collegiate work, including full credits and required subjects, will be entitled, other things being equal, to first consideration for existing vacancies at the date of their application.

No applicant carrying deficiencies in more than six collegiate credits, (including a reading knowledge of German, or French,* and the required two years of high-school Latin), will be considered. Such reading knowledge of these modern languages will be tested upon the above examination dates.

All other qualifications being equal, residents of Minnesota will be given prior opportunity in any vacancies existing at the date of their application.

If an entrance condition is allowed, it must be removed, invariably, before the opening of the succeeding school year.

## FEES

The annual tuition fee in the Medical School is $150, payable in two installments, at the opening of the first and second semesters. No tuition fee is charged for the final hospital or advanced laboratory year, which is now requisite to the degree.

A deposit of $10 in the first year, and of $5 in succeeding years, is required as a caution fee. This fee covers the cost of unnecessary damage to school buildings, of breakage and loss of laboratory apparatus and material, penalties for late registration or late payment of fees, fees for condition examinations, and rentals of post-office box and lockers. Any balance remaining from this deposit will be returned to the student at the close of each year.

Students taking less than the regular course may arrange their fees upon a scale of $3 for each semester-hour's work.

* After 1916-17 German will be specifically required.

Repetition of work in course demands the repetitional payment of fees.

A fee of $1 is required for condition examinations; and a fee of $5 for special examinations.

A fee of $1 is required for attendance of students upon the clinical service of the City and County Hospital of St. Paul. It is payable to the Hospital.

## MICROSCOPES

Students will provide themselves, by purchase, or rental, with a microscope of approved quality and equipment. They may arrange with the Assistant Dean for purchase of microscopes, through the University, upon cash payment or installment plan. Microscopes of suitable type range in cost from $56 upwards.

## COMBINED COURSES IN ARTS AND MEDICINE

Students who are candidates for the degree of Bachelor of Arts, who have successfully completed three years, or 90 credits, of work and have won a fair number of honor points, in the College of Science, Literature, and the Arts, may elect their fourth year in the Medical School and secure the remaining 30 credits and the remaining honor points required for the baccalaureate degree, in that school.

Similarly, students who have completed, with a fair number of honor points, the work of the first two years, or 60 credits, in the College of Science, Literature, and the Arts, may enter The Medical School and upon the successful conclusion of two years' work, with adequate honor points, will receive the degree of Bachelor of Science.

It will be understood that in either of these combined courses the required subjects, viz.: rhetoric, chemistry, zoology, physics and a reading knowledge of German, must be included.

## THE CURRICULUM

Within the four years of study in the Medical School, students cover a total of 4,200 hours of required and elective work. These hours are distributed as follows:

| Subject | Hours |
|---|---|
| Anatomy | 688 |
| Physiology | 416 |
| Physical Chemistry | 96 |
| or | |
| Organic Chemistry | 160 |
| Pathology | 392 |
| Bacteriology | 168 |
| Pharmacology | 160 |
| Hygiene and Medical Jurisprudence | 80 |
| Medicine | 665 |
| Surgery | 547 |
| Obstetrics | 206 |
| Pediatrics | 102 |
| Ophthalmology and Oto-Laryngology | 88 |
| Electives | 592 |

With the year 1918, organic chemistry, as well as general chemistry and qualitative analysis, will become a pre-medical requirement and will not be included in the medical curriculum. It is recommended as a preliminary study at the present time, but provision will be made, until that date, for its inclusion in the schedule of the third year. A complete list of required and elective courses will be found under Departmental Statements.

Certain approved courses in animal biology, chemistry, and other subjects taught in the University, outside the Medical School, may be taken as electives by medical students. A list of these courses is given in the semester programs.

The general arrangement of studies is planned for the average student of medicine. The order of studies is not absolutely fixed. As wide a range of individual freedom is permitted as may prove consistent with systematic education. The Committee on Students' Work has authority, within due bounds of sequence of subjects, to adjust a student's program to his particular preparation, needs, and abilities.

## MIGRATORY STUDENTS

Students migrating from recognized medical schools will present to the Registrar their official credentials of admission requirements, which must be equivalent to those of this school. They will submit to the Students' Work Committee time and subject credits in medicine. They will present to the head of each department, in which they seek exemption or advanced standing, records of successful examinations. These may be accepted as of full value, or supplemented by review examination, at the discretion of the department. Subject credit, but not time credit will be given for work done other than in a medical school. Special work will be arranged for students taking subject credits.

No advanced standing entitles the student to take two years of any graded study coincidently.

## CLINICAL SERVICE

Attendance upon clinics is required and will be recorded.

Seniors are assigned to clinical clerkships in the University Hospital. As clinical clerks they are under the supervision of senior interns or Teaching Fellows, who will assign them to duty.

For this service the hospital is open from 9:30 a.m. to 12 m. and from 1 p.m. to 4:30 p.m. Clinical clerks will record physical examinations, make and record laboratory investigations, and will attend hospital rounds and general clinics. Patients will be examined by clinical clerks only at the direction of the attending clinician.

## EXAMINATIONS

The standing of students is determined by recitations, oral or written examinations, and review of laboratory or clinical note books. Examinations are held at the end of each semester upon the courses closed within that period. Final standings are determined at the close of each semester in conference of the heads of departments with the Students' Work Committee. Reports of such standings are filed in and are announced by the Registrar's office.

A uniform marking system has been adopted for the whole University. Four passing grades, indicated by the symbols *A, B, C,* and *D,* represent differing degrees of merit. The symbol *E* represents a condition, which may be removed by examination and by such supplementary work as the department imposing it may require. *F* stands for a failure and calls for a repetition of the work in class. *I* stands for incomplete and grants the student further time for the completion of the required work.

## CONDITIONS

It is incumbent upon the student to remove a condition at the first opportunity offered. If not so removed it becomes a failure.

Examinations for the removal of conditions and for advanced standing are held at the opening of the school year, from September 19 to 26, 1916. Schedule of examinations may be had upon request.

An opportunity for the removal of first-semester conditions will be given at the Easter recess.

Any student, who, at the end of any given semester, receives grades of *E* or *F* in more than 50 per cent of his registered work in that semester, shall be indefinitely dropped for poor scholarship; such percentage to be estimated upon an actual study-hour basis. Any student so dropped shall not be eligible to condition examination or to reinstatement excepting upon recommendation of the Students' Work Committee and affirmative vote of the Administrative Board.

## REQUIREMENTS FOR GRADUATION

Compliance with the admission requirements; the prior attainment of the degree of Bachelor of Arts or Bachelor of Science, to which one year in medicine for the arts degree, and two years in medicine for the science degree, may contribute; the completion of the full four-year period of required and elective work in the Medical School; an approved hospital internship or advanced laboratory work or public health study for one year; and an unimpeachable moral character, are the essentials for graduation.

The required internship insures to the practitioner of medicine a year of varied clinical experience under competent supervision and gives

to the public a greater assurance of efficiency in the graduate. The alternative of advanced laboratory work serves to encourage men and women of training who desire to enter the profession of medical teaching. The alternative of public health study meets a growing demand for trained medical sanitarians.

## CLINICAL OPPORTUNITIES

### THE UNIVERSITY HOSPITALS

The University is fortunate in the ownership and control of the University Hospital service. The Elliot Memorial Building, the product of a bequest of the estate of the late Dr. and Mrs. A. F. Elliot, supplemented by legislative appropriations, provides a present clinic of 192 beds.

The University Hospital system seeks the highest attainable results in the treatment of patients and the training of students. Its clinical service is closely coöperative with the laboratory departments. Its service is free and patients are admitted only upon the certificate of physicians of the State vouching for the applicant's inability to pay ordinary hospital charges and physician's fees, and stating the clinical character of the case.

A service building provides improved kitchens, dining-rooms, storerooms and quarters for domestic help.

The Outpatient Department of the University Hospitals is housed in Millard Hall. Its removal to the University campus has been accomplished during the past year. Its service is open to free patients and is conducted by the clinical staff of the Faculty of the Medical School. It is subdivided into medical, surgical, gynecological, obstetrical, children's, eye, ear, nose and throat, skin, genito-urinary, nervous and mental, and orthopedic clinics. It enrolled 13,360 new patients and received 49,124 patients' visits during the past year.

Sections of the senior and junior classes are assigned to these clinics daily and are trained in case-history taking, physical examinations and diagnosis, in prescription writing, and in general therapeutic methods.

### AFFILIATED HOSPITALS

The City Hospital of Minneapolis and the City and County Hospital of St. Paul are closely affiliated with the Medical School of the University. One half of their clinical service is under the direction of the Faculty. Attending and consulting staffs are appointed annually upon the recommendation of the Administrative Board of the School.

The combined resources of these two hospitals cover some 1,400 beds. Every phase of clinical service is represented and clinical material is utilized, so far as possible, by the School.

The State Hospital for the Crippled and Deformed, at Phalen Park, invites the Medical School to full participation in its clinical opportuni-

ties. Its superintending surgeon and his aides are members of the faculty. Teaching Fellows and interns of the University Hospital are assigned in rotation to its service. It provides weekly clinics for divisions of the senior class.

## LIBRARY

The library of the Medical School consists of the General Library, housed in Millard Hall, and of small collections of books in the departmental libraries of Medicine, Surgery, Obstetrics, Anatomy, and Pathology and Bacteriology. These departmental collections are readily available to students and investigators. The General Library is open from 9 a.m. to 10 p.m. Some 200 current journals are on file; 14,477 bound volumes and 32,859 unbound volumes and monographs, etc., are catalogued.

The libraries of other schools and colleges in the University and of the Hennepin County and Ramsey County Medical Societies are accessible to students of medicine.

## PRIZES AND FELLOWSHIPS

*The Rollin E. Cutts Prize in Surgery.*—Dr. Martha Smith Cutts, '91 medical, established, some years ago, as a memorial to her husband, the late Dr. Rollin E. Cutts, a fund of $500, the income of which is awarded, in the form of a gold medal, to the member of the senior class of the Medical School who presents the best thesis evidencing original work upon an approved surgical subject.

*The Dr. J. W. Bell Prize.*—Dr. John W. Bell, Emeritus Professor of Clinical Medicine and Physical Diagnosis, has generously provided an annual prize of $100, awarded to the student who evidences the highest proficiency in physical diagnosis.

*The Shevlin Fellowship.*—A fellowship, representing the income of $10,000, established in the Graduate School by the late Thomas H. Shevlin, is open to candidates for one full year's work in acceptable medical research.

## THE SUMMER SESSION

A summer session of six weeks' duration almost immediately follows the commencement exercises in June. The courses in this session are conducted in the laboratories and lecture halls of the Medical School, in the Hospitals and in the Outpatient Department.

The summer session will probably be extended to eight weeks in 1917.

Undergraduates in medicine are admitted in the Summer Session to courses of study offered for the following purposes: (1) to secure advanced standing in degree of the equivalence of these courses to those offered in the regular sessions; (2) to compensate for deficiencies in studies taken in other acceptable schools; (3) to remove conditions or

failures in subjects which are equivalently covered in these courses.

For courses of instruction offered and schedule of tuition fees see Circular of Information of the Summer School.

## THE GRADUATE SCHOOL IN MEDICINE

The Graduate School in Medicine has been established as a part of the main Graduate School of the University. It offers to suitably prepared graduates in medicine courses covering two and three years, leading, respectively, to the Degrees of Master of Science and Doctor of Science. The adequate training of specialists in medicine is one of the main purposes of the school and for this purpose, teaching fellowships, under annual stipends, have been created; with an additional number of graduate scholarships, under an abatement of tuition fees, to which selected graduate students receive appointment.

The field of graduate teaching in medicine has been extended to the inclusion of the opportunities for graduate study and medical research offered by the Mayo Foundation for Medical Education and Research, established at Rochester, Minn. Fellows and graduate scholars are assigned to courses of study both at the University and in the Foundation.

Students in the Medical School who have received the Baccalaureate degree from this or any other approved University may become candidates for the degree of Master of Arts, Master of Science, or Doctor of Philosophy in the Graduate School. In addition to the work credited to the M.D. degree, they must pursue courses of study conforming to the regulations of the Graduate School.

Students registered in the Graduate School may elect majors or minors for the graduate degrees, for which advanced courses are provided, in anatomy, embryology, histology, neurology, pathology, bacteriology, and physiology, in the Medical School.

In all cases, students must comply with the rules and regulations of the Graduate School of the University of Minnesota, further information of which may be found in the Announcement of the Graduate School, or in the Circular of Information on graduate work in medicine. Application blanks for teaching fellowships and scholarships may be had upon request.

## OPPORTUNITIES OF STUDY FOR PHYSICIANS

Physicians who desire to attend medical lectures and clinics for a limited period of time may obtain a visitor's ticket from the Dean. They may enter for regular lecture courses in the Medical School upon a matriculation fee of $10. They may arrange for special courses of study in Anatomy, Physiology, Experimental Surgery, Pathology, Bacteriology, Pharmacology, etc., at a fee of $25 per each full semester's course, with additional charge for material used.

## THE SCHOOL FOR NURSES

The School for Nurses is a department of University instruction under the control of the Medical School. It is conducted in connection with the University Hospitals. It is in charge of a Superintendent, assisted by a committee of management and by a teaching staff selected from the Faculty of the Medical School. While the undergraduates of the School for Nurses constitute in part the nursing corps of the University Hospitals, the school exists primarily for the efficient education of the nurse. It is the first school in the United States organized under direct University control.

A four years high-school course is the minimal requirement for admission. A four months' preliminary course in foundational studies is given before entry to the hospital service. The full course covers a period of three years. It leads to the degree of Graduate in Nursing conferred, upon the recommendation of the Faculty, by the Board of Regents.

Nurses in training are received from certain affiliated hospitals for the completion of their courses of study.

For further information, see Bulletin of The School for Nurses.

## THE SCHOOL OF EMBALMING

With the coöperation of the State Funeral Directors' Association a School of Embalming has been organized by the University, and is conducted for a period of eight weeks, commencing January 3, 1917. It is under the direction of the Administrative Board of the Medical School.

Didactic and laboratory instruction is given in anatomy, bacteriology, chemistry, public health and sanitation, in autopsies, professional embalming, funeral management, and business principles. Certificates are issued to candidates successfully completing the course and are accepted for state license by the State Board of Health.

Circular of Information will be sent upon application.

## THE SOCIAL SERVICE OF THE UNIVERSITY HOSPITALS

A Social Service Department has been established in relation to the hospital system and its outpatient clinics. Its director is engaged in a complete survey of the medical field. In addition to the economic values it will bring the clinical service and the benefits which hospital and dispensary patients will derive from a trained supervision extending to their homes, it will offer opportunities of field work and social study to medical and sociological students.

# TABULAR STATEMENT OF STUDIES IN THE MEDICAL SCHOOL

## 1916-1917

| SUBJECTS | Hours | | Total |
|---|---|---|---|
| Third Year | 1st Sem. | 2nd Sem. | Hours |
| Gross Anatomy (3-4) | 13 | 8 | 336 |
| Histology (Anat. 101) | 10 | ... | 160 |
| Embryology (Anat. 102) | ... | 6 | 96 |
| *Physical Chemistry (Chem. 121) | 6 | ... | 96 |
| Physiologic Chemistry (Physiol. 102) | ... | 10 | 160 |
| General Bacteriology (Path., etc., 104) | ... | 6 | 96 |
| Sub-totals | 29 | 30 | |
| Third Year, Total Hours | | | 944 |

* Organic Chemistry substituted if not taken pre-medically.

| SUBJECTS | Hours | | | | Total |
|---|---|---|---|---|---|
| Fourth Year | 1st Quar. | 2nd Quar. | 3rd Quar. | 4th Quar. | Hours |
| Neurology (Anat. 103) | 6 | 6 | .. | .. | 96 |
| Physiology (103-104) | 8 | 8 | 8 | 8 | 256 |
| Special Bacteriology (Path. etc., 105) | 9 | .. | .. | .. | 72 |
| General Pathology (101) | .. | 12 | .. | .. | 96 |
| Special Pathology (102) | .. | .. | 15 | 14 | 232 |
| Pharmacology (102-104) | .. | .. | 5 | 5 | 80 |
| Physical Diagnosis, etc. (Medicine 50) | .. | .. | 2 | 2 | 32 |
| *Electives | 6 | 6 | 6 | 6 | 192 |
| Sub-totals | 29 | 32 | 36 | 35 | |
| Fourth Year, Total Hours | | | | | 1,056 |

* Elective courses are subject to adjustment by the Students' Work Committee. The hours are distributed in this schedule on a basis of average assignment.

| SUBJECTS | Hours | | | | Total |
|---|---|---|---|---|---|
| Fifth Year | 1st Quar. | 2nd Quar. | 3rd Quar. | 4th Quar. | Hours |
| Pharmacology and Therapeutics. (105) | 2 | 2 | 2 | 2 | 64 |
| Clinical Pathology..... (103) | 4 | 4 | .. | .. | 64 |
| Medicine..... (51 to 55) | 6 | 6 | 5 | 5 | 176 |
| Nervous and Mental Diseases.. (75-76) | .. | 1 | 2 | 2 | 40 |
| Diseases of Children..... (Pediatrics 81) | 1 | 2 | 2 | 2 | 56 |
| Principles of Surgery... ..... (53) | 2 | 2 | 2 | 1 | 56 |
| General Surgery..... (52) | 2 | 2 | 2 | .. | 48 |
| Regional Surgery..... (54) | .. | .. | 3 | 3 | 48 |
| Surgical Technique..... (51) | .. | .. | 1 | 1 | 16 |
| Surgical Diagnostic Clinic..... (57a,b) | 1 | 1 | 1 | 1 | 32 |
| Obstetrics ..... (51-52) | 2 | 2 | 2 | 2 | 64 |
| Gynecology ..... (Obst. 53) | 2 | .. | .. | .. | 16 |
| Section Clinics..... | 6½ | 6½ | 6 | 6 | 200 |
| Electives ..... | 6 | 7 | 7 | 7 | 216 |
| Sub-totals..... | 34 | 35 | 35 | 32 | |
| Fifth Year, Total Hours..... | | | | | 1,096 |

| SUBJECTS | Hours | | | | Total |
|---|---|---|---|---|---|
| Sixth Year | 1st Quar. | 2nd Quar. | 3rd Quar. | 4th Quar. | Hours |
| Therapeutic Conference..... (Pharm. 107) | 1 | 1 | .. | .. | 16 |
| Hygiene ..... (Path., etc., 106-107) | 2 | 2 | 2 | 2 | 64 |
| Medical Clinic..... (Medicine 63-64) | 2 | 2 | 2 | 2 | 64 |
| Mouth Infections..... (Medicine 60) | .. | .. | 1 | .. | 8 |
| Dermatology ..... (Medicine 91) | 1 | 1 | .. | .. | 16 |
| Medical Jurisprudence..... (Medicine 62) | .. | .. | 2 | .. | 16 |
| General Surgery..... (55) | .. | .. | 2 | 2 | 32 |
| Urology ..... (Surgery 73) | 1 | 1 | .. | .. | 16 |
| Ophthalmology and Otology... (79) | 2 | 2 | .. | .. | 32 |
| Rhinology and Laryngology... (81) | 1 | 1 | .. | .. | 16 |
| Obstetrics and Gynecology..... (57 to 61) | 2 | 2 | 3 | 3 | 80 |
| Section Clinics and Clerkships. | 17 | 17 | 17 | 17 | 544 |
| Electives ..... | 6 | 6 | 6 | 7 | 200 |
| Sub-totals..... | 35 | 35 | 35 | 33 | |
| Sixth Year, Total Hours..... | | | | | 1,104 |

# DEPARTMENTAL STATEMENTS*

## THE DEPARTMENT OF ANATOMY

Professors CLARENCE M. JACKSON, JOHN B. JOHNSTON, THOMAS G. LEE, RICHARD E. SCAMMON; Associate Professor CHARLES A. ERDMANN; Instructors WILLIAM F. ALLEN, WALTER E. CAMP, JAY A. MYERS, CHESTER A. STEWART; Assistants WYMAN C. COLE, JOHN A. KITTELSON, JOHN C. MCKINLEY, EDGAR H. NORRIS, LLOYD H. RUTLEDGE, FLORIEN VAUGHN.

Departmental Office, Institute of Anatomy

### REQUIRED COURSES

1a,b. ELEMENTARY HUMAN ANATOMY. School for Nurses. 48 hours; two credits. KITTELSON.

3-4. GROSS HUMAN ANATOMY. Dissection, including osteology. A disarticulated skeleton loaned to every two students. Every student required to dissect lateral half of the body. Third year medical students; 13 hours a week, first semester; 8 hours a week, second semester. 336 hours; ten credits. JACKSON, ERDMANN, MYERS and Assistants.

5-6. GROSS HUMAN ANATOMY. Morphology of the various systems. Osteology. Splanchnology, with special reference to the digestive system. Dissection of the head, neck and trunk. First year dental students. 288 hours; eight credits. JACKSON, ALLEN, ERDMANN and Assistants.

8. HISTOLOGY AND EMBRYOLOGY. Minute structure and development of the tissues and organs. First year dental students. 128 hours; four credits. LEE, CAMP and Assistants.

101. HUMAN HISTOLOGY. Microscopic study of the various tissues and organs. Third year medical students. 160 hours; five credits. SCAMMON, CAMP and Assistants.

102. HUMAN EMBRYOLOGY. Development of the human body. Third year medical students. Prerequisite: Course 101. 96 hours; three credits. LEE, SCAMMON and Assistants.

103. HUMAN NEUROLOGY. A study of the central nervous system and sense organs. Fourth year medical students. Prerequisite: Courses 101, 102. 96 hours; three credits. JOHNSTON, ALLEN, CAMP.

* Courses with number followed by "a,b." are given in each semester. Odd numbers denote first semester, and even numbers second semester courses.

ELECTIVE COURSES

108. Drawing for Publication. Advanced course in methods, principles and technique of drawings intended for publication. Limited to six students. 40 hours; one and one-half credits. Whitney.

109. Autopsy Anatomy. A study of the gross anatomy of fresh organs obtained at autopsy. Hours and credits to be arranged. Camp.

111. Anatomical Technique. Microtechnique, reconstruction and museum methods, etc. Open to fourth, fifth or sixth year medical students. Limited to sixteen students. 96 hours; three credits, or less. Lee, Allen.

113. Advanced Histology. A study of special preparations, including practice in the identification of unknown specimens. Open to fourth, fifth or sixth year medical, or graduate students. Limited to sixteen students. Prerequisite: Course 101. 96 hours, three credits, or less. Camp.

114. Topographic Anatomy. Based upon a study of serial cross-sections of the human body. Open to fourth, fifth or sixth year medical, or graduate students. Limited to twenty-four students. Prerequisite: Course 3-4. 96 hours, three credits, or less. Jackson.

115. Fetal Anatomy. Study of the human fetus, with comparison of earlier embryonic and later post-natal structure. Open to fourth, fifth or sixth year medical, or graduate students. Limited to twenty students. Prerequisites: Courses 3-4, 102. 96 hours, three credits, or less. Scammon.

117. Implantation of Ovum. A study of the implantation of the ovum and the formation of the decidua in man and mammals. Open to fourth, fifth or sixth year medical, or graduate students. Limited to twelve students. Prerequisite: Course 102. 96 hours; three credits, or less. Lee.

118. Applied Anatomy. Relationships, with reference to their clinical applications. Open to fourth, fifth or sixth year medical, or graduate students. Prerequisite: Course 3-4. 48 hours; one and one-half credits. Erdmann.

119. Special Dissections. Dissections of special regions, including preparation of museum specimens. Open to fourth, fifth or sixth year medical, or graduate students. Limited to twenty-four students. Prerequisite: Course 3-4. 96 hours; three credits, or less. Erdmann.

121. Experimental Neurology. A study of the morphology of the central nervous system as determined by experimental methods. Open to fifth or sixth year medical, or graduate students. Limited to five students. Prerequisite: Course 103. 96 hours; three credits, or less. Allen.

123-124. ADVANCED ANATOMY. Advanced work, largely individual in character, in gross anatomy, histology, or embryology. Open to fourth, fifth or sixth year medical, or graduate students. Admission only upon approval of instructor. Hours and credits to be arranged. JACKSON, LEE, OR SCAMMON.

201-202. RESEARCH IN ANATOMY. Research work in gross or microscopic anatomy, neurology, histology, or embryology, for properly qualified students, graduates or others, upon approval of any one of the instructors. Hours and credits to be arranged. JACKSON, JOHNSTON, LEE, SCAMMON.

203-204. ANATOMICAL SEMINAR. Presentation and discussion of research work in progress in the department, together with reviews of current anatomical literature. Open to graduates or others upon approval of instructor. 32 hours; two credits. JACKSON.

## THE DEPARTMENT OF PHYSIOLOGY

Professor ELIAS P. LYON; Associate Professors RICHARD OLDING BEARD, FREDERICK H. SCOTT; Assistant Professors JOHN F. MCCLENDON, M. RUSSELL WILCOX; Instructors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE; Assisstants EDWARD D. ANDERSON, ROY E. CRUZEN, LYLE J. ROBERTS, ALBERT M. SNELL.

Departmental Office, Millard Hall

### REQUIRED COURSES

1,2. HUMAN PHYSIOLOGY AND HYGIENE. A course in the essentials of human physiology and hygiene, planned to afford teachers a helpful knowledge of the human subject whom they are engaged in teaching. Offered to public school teachers and others. 32 hours; two credits, in each semester. BEARD, LYON and Assistants.

3a,b. ELEMENTARY HUMAN PHYSIOLOGY. School for Nurses, Home Economics students and others. Prerequisites: elementary biology and chemistry. 96 hours; three credits. BEARD, LYON, SCOTT and Assistants.

4. ELEMENTARY PHYSIOLOGY. Sophomore dental students. Prerequisites: elementary biology or anatomy and chemistry. 112 hours; four credits. LYON, BEARD, SCOTT and Assistants.

5.* ELEMENTARY PHYSIOLOGY. Junior dental students. Prerequisites: elementary biology or anatomy and chemistry. 80 hours; three credits. LYON, BEARD, SCOTT and Assistants.

6. ELEMENTARY PHYSIOLOGIC CHEMISTRY. Sophomore dental students.

* Only given in this session, to dental junior students in three years' course.

Prerequisite: organic chemistry. 80 hours; three credits. PETTIBONE, KINGSBURY and Assistants.

7.* ELEMENTARY PHYSIOLOGIC CHEMISTRY. Junior dental students. Prerequisite: organic chemistry. 64 hours; two credits. PETTIBONE, KINGSBURY and Assistants.

102. PHYSIOLOGIC CHEMISTRY. The components of the animal body; foods, digestion, the excreta and metabolism. Third year medical students and others. Prerequisite: organic chemistry, one semester. 160 hours; five credits. PETTIBONE, KINGSBURY, MCCLENDON and Assistants.

103. PHYSIOLOGY OF MUSCLE, NERVE, BLOOD, CIRCULATION AND DIGESTION. Fourth year medical students and others. Prerequisites: physiologic chemistry (102) and animal biology. 128 hours; four credits. SCOTT, LYON, BEARD, MCCLENDON and Assistants.

104. PHYSIOLOGY OF THE NERVOUS SYSTEM AND SPECIAL SENSES; RESPIRATION, METABOLISM, NUTRITION AND EXCRETION. Fourth year medical students and others. Prerequisite: Course 103. 128 hours; four credits. LYON, BEARD, SCOTT, MCCLENDON and Assistants.

## ELECTIVE COURSES

111. PHYSICAL CHEMISTRY OF CELLS. Osmotic pressure, surface tension and electric conductivity of blood and urine; colloids; permeability of cells and tissues, and changes in permeability produced by electrolytes. Prerequisites: animal biology and two courses in chemistry. 96 hours; three credits. MCCLENDON.

112. ELECTRO-PHYSIOLOGY. The bio-electric currents and the theory of stimulation and narcosis. Hydrogen ion concentration and its relation to enzyme activity and irritability. Prerequisites: animal biology and two courses in chemistry. 96 hours; three credits. MCCLENDON.

113-114. ADVANCED PHYSIOLOGY Course arranged by instructors with qualified students. Each student will be assigned a topic for special laboratory study, leading in some cases to original investigation. Open to fourth, fifth or sixth year medical students and others. 96 hours; three credits, or more; either or both semesters. LYON, SCOTT, OR MCCLENDON.

115-116. CONFERENCE COURSE IN PHYSIOLOGY; STUDENT SEMINAR. Informal lectures and library study. Topic: first quarter, internal secretion; second quarter, digestion; third quarter, respiration; fourth quarter, nervous system. Prerequisites: Courses 102, 103 and 104. 12 hours, each quarter; one and one-half credits, each semester. LYON OR SCOTT.

131. PHYSIOLOGY OF THE BLOOD. Alterations due to physiological conditions. Methods of examination. Open to fourth, fifth or sixth year

medical students. Limited to sixteen students. 48 hours; one and one-half credits. SCOTT.

132. PHYSIOLOGY OF THE CIRCULATION. Conference and laboratory work. Open to fourth, fifth or sixth year medical students. Limited to sixteen students. Conference may be taken separately. 12 or 48 hours; three-fourths or one and one-half credits. SCOTT.

137. FOODS AND PRACTICAL DIETETICS. A study of human foods and food values; of the principles of food selection; of caloric indices and balanced dietaries. Exercises in the practical preparation of foods. Open to fourth, fifth or sixth year medical students. Limited to twelve students. 40 hours; two credits. BEARD, THOMAS.

138. PHYSIOLOGY OF DEVELOPMENT. The physiology of the ovum, the embryo, the fetus; the functions of menstruation, ovulation, pregnancy, parturition and lactation; the functional characteristics of birth, infancy, childhood, adolescence, maturity and old age. Open to fourth, fifth or sixth year medical students. 32 hours; two credits. BEARD.

139. EXAMINATION OF THE EYE AND EAR. A study of advanced methods. Lectures, demonstrations and laboratory exercises. Prerequisite: Course 104. Open to fifth or sixth year medical students. 24 hours; one credit. WILCOX.

140. PHYSIOLOGY OF ACCOMMODATION. A study of optical principles and methods. Lectures, demonstrations and laboratory exercises. Open to fifth or sixth year medical students. 24 hours; one credit. WILCOX.

151-152. PHYSIOLOGIC CHEMISTRY. The components of the body, foods, digestion and metabolism. Prerequisite: organic chemistry. Open to qualified students in all divisions of the University. May be taken by medical students in place of Course 102. 96 hours; three credits; in each semester. KINGSBURY and Assistants.

153-154. ADVANCED PHYSIOLOGIC CHEMISTRY. Course arranged by instructors with qualified students for special work. Open to fourth, fifth or sixth year medical students and others; may be taken in either semester or both. Prerequisite: Course 102. 96 hours; three credits, either semester. PETTIBONE OR KINGSBURY.

161. URINALYSIS. Advanced methods. Open to fourth, fifth or sixth year medical and other qualified students. First quarter. Prerequisite: physiologic chemistry, course 102. 48 hours; one and one-half credits. PETTIBONE.

163. METABOLISM. Special phases of metabolism. Lectures may be taken alone; number of students unlimited; laboratory course limited to ten students. Open to fourth, fifth or sixth year medical students and others. Prerequisite: physiologic chemistry, course 102. 48 hours; three-fourths or one and one-half credits. PETTIBONE.

164. QUANTITATIVE METHODS. The estimation of certain important substances in the urine, blood and other body fluids. Open to fourth, fifth or sixth year medical students. Prerequisite: Course 102. 96 hours; three credits. KINGSBURY.

201-202. SEMINAR IN PHYSIOLOGY AND PHARMACOLOGY. For instructors and advanced students. 16 hours, each semester; one credit. LYON, HIRSCHFELDER and Staff.

203-204. RESEARCH IN PHYSIOLOGY. Hours and credits arranged. LYON, SCOTT OR MCCLENDON.

205-206. RESEARCH IN PHYSIOLOGIC CHEMISTRY. Hours and credits arranged. KINGSBURY OR PETTIBONE.

208.* SEMINAR IN PHYSIOLOGIC OPTICS. Primarily for graduate students. Open to sixth year medical students. 24 hours; one and one-half credits. LYON.

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* Not given 1916-17.

## DEPARTMENT OF PHARMACOLOGY

Professor ARTHUR D. HIRSCHFELDER; Associate Professor E. D. BROWN; Assistant Professor ROBERT A. HALL.

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Departmental Office, Millard Hall

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### REQUIRED COURSES

1a,b. ELEMENTARY PHARMACOLOGY. A study of the history, uses, classification and preparation of drugs; definition of descriptive terms; systems of weights and measures; methods of administration, principles of dosage, etc. School for Nurses and others. 64 hours; three credits. HALL.

4. COURSE IN PHARMACOLOGY. The history, origin, nature, pharmacal preparations, and uses of drugs, including the discussion of their physiologic, pharmacologic, and therapeutic actions. Second year dental students. 32 hours; two credits. HALL.

102. GENERAL PHARMACOLOGY. The principles underlying the structure, physico-chemical properties, physiologic, therapeutic and toxic actions of substances, natural or synthetic, used as medicines. Fourth year medical students. 32 hours; two credits. HIRSCHFELDER, BROWN.

104. EXPERIMENTAL PHARMACOLOGY. Exercises illustrating the preparation and action of medicines, their relation to chemical structure and their mode of administration. Fourth year medical students. 48 hours; one and one-half credits. HIRSCHFELDER, BROWN, HALL.

105a,b. General Pharmacology and Therapeutics. A more detailed study of drugs important in clinical practice, covering the relations of chemical structure to physiologic and therapeutic action and modes of application in clinical medicine. Fifth year medical students. 64 hours; three credits. Hirschfelder, Brown.

107. Therapeutic Conference. A systematic discussion of selected cases studied from case notes. Sixth year medical students. 16 hours; one credit. Hirschfelder.

ELECTIVE COURSES

6. Experimental Pharmacology. Experiments upon the effects of the important heart and nerve stimulants, sedatives, purgatives and antiseptics. Offered to dental and pharmacy students and nurses. 24 to 48 hours; one to two credits. Hirschfelder, Brown, Hall.

109a,b. Experimental Pharmacology. Special investigation and experimental study of one or more subjects in pharmacology, in which the student is given an opportunity of choice of the following topics:

a. Anesthetics, general and local; the principles and dangers of anesthesia.
b. Stimulants and depressants of the circulation and their relation to the treatment of heart disease.
c. Drugs acting upon the kidneys, normal or diseased.
d. Urinary antiseptics and the urinary excretion of drugs.
e. Action and detection of poisons and their antidotes.
f. Detailed study of the effects in man of the common harmless drugs.
g. The internal secretions and gland extracts; their effect upon the action of drugs.
h. Action of drugs upon animal and bacterial parasites, tumors, etc.

Offered in the second half of the fourth year and in the entire fifth or sixth year. 24 or 48 hours; one or two credits, each semester. Hirschfelder, Brown, Hall.

110. Poisons. Their detection, actions and antidotes. Open to fourth, fifth or sixth year medical students. 48 hours; one and one-half credits. Brown, Hall.

111a,b. Prescription Writing. The principles of prescription writing; study of the flavoring, coloring and incompatibilities of drugs. Open to fourth, fifth or sixth year medical students. 16 hours; one credit. Brown.

112. Practical Materia Medica and Prescription Writing. The study of crude drugs, pharmaceutical preparations and of the flavoring and compounding of prescriptions. Open to fourth, fifth and sixth year medical students. 8 hours; one-half credit. Brown.

113a,b. The Physiological and Chemical Basis of Pharmacology. The relation of drug action to chemical structure; the mode of action and

therapeutic application of various synthetic drugs; the study of chemotherapy. Primarily for students in the School of Chemistry. 80 hours; three credits. HIRSCHFELDER.

201-202. SEMINAR IN PHYSIOLOGY AND PHARMACOLOGY. Reviews of recent literature bearing upon physiologic and pharmacologic subjects. Conducted by department directors, with the collaboration of the staffs and of qualified graduate or undergraduate students. 32 hours.

203-204. RESEARCH IN PHARMACOLOGY. HIRSCHFELDER, BROWN, HALL.

## THE DEPARTMENT OF PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

Professor HAROLD E. ROBERTSON; Associate Professors ELEXIOUS T. BELL, WINFORD P. LARSON; Assistant Professor MOSES BARRON; Professorial Lecturer HENRY M. BRACKEN; Instructors ANNE G. BENTON, ARTHUR T. HENRICI, WILLIAM C. JOHNSON, ALBERT C. POTTER, MARGARET WARWICK; Assistants W. RAY SHANNON, KANO IKEDA.

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Departmental Office, Institute of Public Health and Pathology

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### REQUIRED COURSES

1a,b. ELEMENTARY BACTERIOLOGY. The principles governing the growth, isolation, and general characters of bacteria; the principles of sterilization and asepsis. School for Nurses. 64 hours; three credits. HENRICI, BENTON.

3. BACTERIOLOGY. The principles which govern the isolation and study of bacteria, with particular attention to the bacteria and other parasites of the mouth and teeth. Brief studies of pathogenic organisms which produce, or appear in rheumatism; their relation to infections of the teeth. Dental students. 48 hours; two credits. HENRICI.

4. PATHOLOGY. The study and recognition of gross and microscopic disease processes. The principles of general pathology with special consideration of diseases peculiar to the mouth and teeth and important in dental practice. Dental students. 48 hours; two credits. ROBERTSON, HENRICI.

6a,b. ELEMENTARY BACTERIOLOGY. The principles of general bacteriology and their application to home economics. Studies in the growth of bacteria and in methods of isolation and recognition; the preparation of culture media and effective processes for sterilization. Home economics students and others. Prerequisite: general chemistry, and botany or zoology. 80 hours; three credits. HENRICI, BENTON.

101. General Pathology. The general principles governing pathologic changes, including disturbances of the circulation and metabolism; inflammation, regeneration and repair; tumor formation. The study and recognition of gross and microscopic lesions. Fourth year medical students. Prerequisite: Course 101, histology. 96 hours; four credits. Robertson, Bell, Barron.

102. Special Pathology. Applications of principles to the study of the pathologic processes of infectious diseases, such as diphtheria, typhoid fever, etc.; the special pathology of lesions in various organs, systems of organs and tissues of the body. Fourth year medical students. Prerequisite: Course 101, general pathology. 232 hours; eight credits. Robertson, Bell, Barron.

103. Clinical Pathology. The principles and methods involved in the examination of urine, blood, stomach contents, feces, sputum, exudates and transudates; the relation of pathologic findings to the diagnosis of disease. Fifth year medical students. 64 hours; two credits. Johnson and Staff.

104. General Bacteriology. The preparation of culture media; the morphology of bacteria; methods of staining and identification; anaerobic bacteria; principles of sterilization and disinfection; examination of air, water, milk; relation of bacteriology to the industries. Third year medical students and others. Prerequisites: general chemistry, and botany or zoology. 96 hours; four credits. Larson, Benton.

105. Special Bacteriology. The study of pathogenic bacteria, especially in relation to definite diseases; bacteriological methods in clinical diagnosis; principles of infection and immunity with practical application of serum reactions. Fourth year medical students and others. Prerequisite: Course 104, general bacteriology. 72 hours; three credits. Larson, Benton, Henrici.

106-107. Course in Hygiene. Lectures by various experts upon Public Health Administration and Laws; Vital Statistics; Occupational Diseases; Transmissible Diseases; Public Health Laboratory Methods; Epidemiology; Sanitary Engineering; Laboratory Investigations of Water, Sewage and Milk; Insects and Disease; Personal Hygiene; Dental Hygiene; School Hygiene; Infant Mortality; Life Extension; Social Service; Industrial Hygiene. Sixth year medical students. 64 hours; four credits. Bracken and associated lecturers.

109a,b. Clinical Pathology. Practical work in the examination of blood, urine, stomach contents, sputum, etc. Conducted in the Outpatient Department with class sections. Sixth year medical students. 12 hours each quarter. Warwick.

111a,b. Autopsies. The technique of performing autopsies, making proper records of same, and the examination of fresh organs removed

from these autopsies. Opportunities afforded to study the observed lesions microscopically. Three or four students called to each post-mortem, excused from regular classes. Preference given to senior students. Each candidate for the degree must have taken part in at least four autopsies. Fifth and sixth year medical students. The Staff.

## ELECTIVE COURSES

112. PATHOLOGIC TECHNIQUE. General and special methods of preparation of microscopic and gross pathologic specimens; including practice with freezing microtome, celloidin and paraffin embedding methods, general and special stains, preparation of museum specimens, etc. Limited to ten students. Fourth, fifth and sixth year medical students. Prerequisite: Course 101, general pathology. 48 hours; one and one-half credits. ROBERTSON.

114. ADVANCED BACTERIOLOGY. An advanced course giving additional work in bacteriology and the opportunity of working out special problems. Fifth year medical students. Limited to ten students. 48 hours; one and one-half credits. LARSON.

115a,b. COURSE IN IMMUNITY. The study of natural and acquired immunity; including experiments to show the several types of protective substances and the principles and technique of serum diagnosis. Fifth or sixth year medical students. Limited to ten students in each semester. 48 hours; one and one-half credits. LARSON.

117. DIAGNOSIS OF TUMORS. Rapid diagnosis and study of tumors and other pathologic conditions simulating tumor formation. Fifth and sixth year medical students. Prerequisite: Course 102, special pathology. 48 hours; one and one-half credits. BELL.

118. GYNECOLOGICAL PATHOLOGY. The special study of pathologic conditions found in the female genital tract. This elective is an integral part of Course 102, special pathology. Fourth, fifth or sixth year medical students. 48 hours; one and one-half credits. BELL, ADAIR.

120. NEUROPATHOLOGY. The special study of pathologic conditions of the nerve tissues in lesions of the central and peripheral nervous system. This elective is an integral part of Course 102, special pathology. Fourth, fifth or sixth year medical students. 24 hours. BELL AND HAMILTON.

121. CLINICAL LABORATORY COURSE. Practical diagnostic study in the outpatient department laboratory. Limited to sections of four students. Fifth or sixth year medical. 18 hours; one-half credit. WARWICK.

122. MEDICAL ENTOMOLOGY. A study of those insects, and their near relatives, which are disease-bearers or parasites of man; life-history, habits and methods of control. Fourth, fifth or sixth year students.

Prerequisite: animal biology, Course 3-4, or equivalent. 32 hours; two credits. HOWARD.

124. HEMATOLOGY. Advanced studies in diseases of the blood; with particular attention to special technical procedures and the significance of laboratory findings. Fifth or sixth year medical students. 48 hours; one and one-half credits. JOHNSON.

201-202. RESEARCH. Graduate students, of the necessary preliminary training, may elect research, either as majors or minors, in pathology or bacteriology. Hours and credits to be arranged. ROBERTSON, BELL, LARSON.

## THE DEPARTMENT OF SURGERY

Professors JAMES E. MOORE, ARTHUR J. GILLETTE; Associate Professors J. FRANK CORBETT, ARTHUR A. LAW, ARCHIBALD MACLAREN, ARTHUR T. MANN, JOHN T. ROGERS; Assistant Professors ALEXANDER R. COLVIN, WARREN A. DENNIS, EMIL S. GEIST, OSCAR OWRE, HARRY P. RITCHIE, ARTHUR C. STRACHAUER, FRANKLIN R. WRIGHT; Instructors JOHN S. ABBOTT, PAUL F. BROWN, CARL C. CHATTERTON, WALLACE COLE, EARLE R. HARE, JAMES A. JOHNSON, FREDERICK H. POPPE, CHARLES A. REED, HARRY B. ZIMMERMAN; Assistants WILLIAM C. CARROLL, EUGENE K. GREEN, CHARLES A. HALLBERG, JOHN P. HIEBERT, WALTER J. KREMER, HENRY C. STUHR, ANTON J. WETHALL; Teaching Fellows DONALD F. CAMERON, GOLDER L. MCWHORTER.

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Departmental Office, Millard Hall

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### REQUIRED COURSES

50. SURGICAL TECHNIQUE. A course in operative principles. Lectures and demonstrations. Fifth year. 16 hours. HARE.

51. GENERAL SURGERY. The diseases and injuries of tendons, fasciae, bursae, blood-vessels, nerves, brain and meninges. Lectures and demonstrations. Fifth year. 32 hours. LAW.

52. SURGICAL QUIZ. For fifth year students. 16 hours. MOORE.

53-54. PRINCIPLES OF SURGERY. A study of surgical inflammations, etc.; illustrated by gross and microscopic preparations from the living subject and from experimental courses. Lectures and demonstrations. Fifth year. 56 hours. CORBETT.

56. REGIONAL SURGERY. The practical surgery of the several regions of the body; diseases of bones, injuries and acute diseases of joints, etc. Lectures and demonstrations. Fifth year. 48 hours. MOORE.

58. General Surgery. Fractures and dislocations. Lectures and demonstrations. Sixth year. 32 hours. Law.

59-60. Diagnostic Clinic. A series of clinics upon the diagnosis of surgical conditions as presented in the hospital wards. Fifth year. 32 hours. Moore.

61-62. Diagnostic and Operative Clinic. A course in operative procedure conducted at the University Hospitals, the Minneapolis City Hospital, and the City and County Hospital at St. Paul, on Thursdays and Saturdays, throughout the year. Fifth year class, in sections. 56 hours. Moore, Law, MacLaren, Ritchie, Strachauer, Mann, Poppe, Rogers, Colvin.

63a,b. Clinical Clerkships. Direct observation of patients in hospital, under supervision of senior internes or teaching fellows; taking and recording of case histories and making of provisional diagnoses. Sixth year. 64 hours, each quarter. Clinical Staff.

64a,b. Operative Clinic. A course of operations in the University Hospitals, the Minneapolis City Hospital, and the City and County Hospital at St. Paul, on Tuesdays, Thursdays, and Saturdays. For sections of class: sixth year. 48 hours. Moore, Law, MacLaren, Ritchie, Strachauer, Mann, Poppe, Rogers, Colvin.

65a,b. Minor Operative Clinics. Courses conducted with class sections on three days in each week at the Out-patient Department. Sixth year. 12 hours. Strachauer, Hare and Assistants.

## ELECTIVE COURSES

101a,b. Course in Minor Surgery. The study of diagnosis and treatment of selected cases. Sixth year. 36 hours. Strachauer, Hare, and Assistants.

103. Operative Course on the Cadaver. The technique of abdominal incision and closure; of bowel suturing, appendiceal removal, kidney exploration, nephrotomy, tracheotomy, amputations, ligations, and other problems in emergency surgery. Fifth year. 32 hours. Corbett.

104a,b. Surgical Problems. A study of approved problems, selected by students in the course, in operative, physiological, histological, and chemical methods. Fifth year. 24 hours, or more. Corbett.

106. Course in Tumors. The pathology and diagnosis of tumors, classified by anatomical relation. Sixth year. 24 hours. Corbett.

108. Course in Experimental Surgery. A study of surgical technique by cardinal operations upon animals. Sixth year. 40 hours. Corbett.

109a,b. Diagnostic Clinic, with Occasional Operations. Conducted at

the City and County Hospital, St. Paul. Limited to ten students. Fifth or sixth year. 12 hours. COLVIN.

110. LOCAL ANESTHESIA. Methods and applications of local anesthesia in both major and minor surgery. Fifth and sixth year. 8 hours. STRACHAUER.

111. EXTRACTION OF TEETH. Course offered in the College of Dentistry. Limited to eight students. Fifth or sixth year. 8 hours. GRIFFITH.

112. SURGICAL QUIZ. A review of surgical studies by recitation and conference. Sixth year. 16 hours. MANN.

119-120. BEDSIDE SURGICAL CLINIC. Limited to four students. Repeated each quarter in the sixth year. 8 hours. MOORE.

122. MEDICAL ETHICS AND ECONOMICS. Offered to students in the fourth quarter of the sixth year. 8 hours. MOORE.

### DIVISION OF ORTHOPEDIA

#### REQUIRED COURSES

70a,b. ORTHOPEDIC SURGERY. A course of clinical lectures and operations conducted in each quarter, with divisions of class, at the Hospital for Crippled and Deformed at Phalen Park. Sixth year. 24 hours. GILLETTE, CHATTERTON.

71a,b. ORTHOPEDIC CLINIC. A study of cases of orthopedic disease and treatment at the Out-patient Department; with class sections, three weekly sessions. Sixth year. 8 hours. GEIST, REED, COLE.

#### ELECTIVE COURSES

113a,b. CLINIC IN ORTHOPEDIC SURGERY. The study of selected cases. Conducted in Out-patient Department. Limited to three students. Sixth year. 36 hours. GEIST, REED.

114. ORTHOPEDIC SURGERY. Illustrated clinical lectures. Sixth year. 24 hours. GEIST.

115a,b. CLINIC IN ORTHOPEDIC SURGERY. Conducted at Phalen Park Hospital for the Crippled and Deformed. 24 hours in each semester. COLE.

### DIVISION OF UROLOGY

#### REQUIRED COURSES

73. GENITO-URINARY DISEASES. The etiology, diagnosis, and treatment of this group of diseases. A course of lectures. Sixth year. 16 hours. WRIGHT.

75a,b. GENITO-URINARY CLINIC. The study of cases at the bedside and in the operating rooms of the several hospitals. Sixth year. 8 hours. WRIGHT, OWRE, FREEMAN.

77a,b. GENITO-URINARY CLINIC. The observation, examination, and treatment of patients in the Out-patient Service at three weekly sessions Sixth year. 8 hours. WRIGHT, OWRE and Assistants.

ELECTIVE COURSES

117a,b. GENITO-URINARY DISEASES. The study of cases in the Out-patient clinics, giving the student the opportunity of examination and supervised treatment of patients. Sixth year. 36 hours. WRIGHT, OWRE, and Assistants.

118a,b. ENDOSCOPY AND CYSTOSCOPY. Methods of investigation and treatment. Conducted in Out-patient Department. Sixth year. 8 hours. WRIGHT.

## THE DEPARTMENT OF MEDICINE

Professors LEONARD G. ROWNTREE, ARTHUR S. HAMILTON, S. MARX WHITE, ARTHUR SWEENEY; Research Professor THOMAS B. HARTZELL; Associate Professor JAMES S. GILFILLAN; Assistant Professors ERNEST M. HAMMES, ANGUS W. MORRISON, SOREN P. REES, SAMUEL E. SWEITZER, HENRY L. ULRICH; Lecturer HENRY WIREMAN COOK; Instructors JOHN M. ARMSTRONG, EARNEST L. BAKER, CLIFTON A. BOREEN, JOHN BUTLER, PAUL B. COOK, CHARLES RALPH DRAKE, EDWIN L. GARDNER, ALEXANDER R. HALL, HARRY J. IRVINE, HAROLD PEDERSON, ERNEST T. F. RICHARDS, ROBERT I. RIZER, JOHN P. SCHNEIDER, FREDERICK W. WITTICH; Research Assistant WILLIAM A. GREY; Assistants EDWARD J ENGBERG, ADOLPH E. LOBERG, JOSEPH C. MICHAELS, HARRY P. NORDLEY, JAMES M. NORTHINGTON, JOHN H. SCHROEDER; Teaching Fellows FLOYD GRAVE, RALPH EDWIN MORRIS, HENRY W. WOLTMANN.

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Departmental Office, Millard Hall

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REQUIRED COURSES

50. CASE TAKING AND PHYSICAL DIAGNOSIS. A study of general symptomatology; the methods of physical examination, diagnosis and record, with practical training upon the normal and abnormal subject. Fourth year. 32 hours. ROWNTREE, SCHNEIDER and Assistants.

51-52. THE PRINCIPLES AND PRACTICE OF MEDICINE. Diseases of the heart and bloodvessels; of the bronchi, lungs and pleura; of the intestinal tract; renal diseases; acute infections. Fifth year. 64 hours. ROWNTREE, WHITE, REES, RICHARDS, RIZER.

53a,b. PHYSICAL DIAGNOSIS AND CASE TAKING. Conducted in sections in the clinics of the Out-patient Department. Fifth year; one half the

class in each semester. 144 hours. SCHNEIDER, RIZER, GARDNER, WITTICH and Assistants.

55a,b. PRACTICAL THERAPY AND THERAPEUTIC TECHNIQUE. A study of special methods of therapeusis. Fifth year; one half the class in each semester. 16 hours. RICHARDS and Assistants.

57a,b. CLINIC IN MEDICINE. Conducted in the University Hospital. Fifth year; one half the class in each semester. 32 hours. ULRICH.

59a,b. SECTION CLINICS IN MEDICINE. Conducted throughout the year in the Minneapolis City Hospital and the City and County Hospital, St. Paul. Fifth year. 16 hours. GILFILLAN, REES and Associates.

60. MOUTH INFECTIONS. The typical infections of the oral cavity and their causal relations to disease. Fourth quarter. Sixth year. 8 hours. HARTZELL.

62. MEDICAL JURISPRUDENCE. The principles of law, the rules of evidence and the duties of physicians in medico-legal cases. Third quarter. Sixth year. 16 hours. SWEENEY.

63a,b. CLINIC IN MEDICINE. A study of cases and case histories in the University Hospital service. Sixth year. 64 hours. ROWNTREE, WHITE.

65a,b. CLINICAL CLERKSHIPS. The personal and direct observation of patients in hospital under the supervision of the staff; the taking and recording of case histories and the making of provisional diagnoses. One fourth of class in each quarter. Hospital open for this service from 9:30 to 12 and 1 to 4:30. Sixth year. 144 hours.

67a,b. SECTION CLINICS IN MEDICINE. Conducted throughout the year at the Minneapolis City Hospital and the City and County Hospital of St. Paul. Sixth year. 8 hours. GILFILLAN, REES and Associates.

## ELECTIVE COURSES

101a,b. OUT-PATIENT CLINICS. The advanced study of selected cases in the outpatient service. Three weekly sessions throughout the year. Limited to four students. Open to those who have completed their clinical clerkships. Sixth year. 36 hours. The Staff.

103a,b. BEDSIDE CLINICS IN MEDICINE. Conducted at the City and County Hospital, St. Paul. Limited to ten students. Fifth year. 12 hours. HALL.

104. THE EXAMINATION FOR LIFE INSURANCE. The requirements of standard and special examinations of applicants for life insurance. Fifth or sixth year. 8 hours. COOK.

105. ACUTE INFECTIOUS DISEASES. Non-contagious. A comparative study of fevers. City Hospital. Limited to six students. Sixth year. 8 hours. REES.

106. DISEASES OF THE RESPIRATORY TRACT. A study of physical signs. City Hospital. Limited to six students. Fifth year. 8 hours. REES.

107a,b. ADVANCED PHYSICAL DIAGNOSIS OF THE CHEST. Practical work on tuberculosis patients at available hospitals. Two classes of six students each. Fifth and sixth year. REES, WITTICH and Associates.

108. ADVANCED WORK IN GRAPHIC RECORDING AND FUNCTIONAL DIAGNOSIS OF CARDIO-VASCULAR DISEASES. A study of the use of the polygraph and electro-cardiagraph. Limited to six students. Sixth year. 16 hours. WHITE.

109. PROBLEMS IN ADVANCED MEDICAL DIAGNOSIS. Limited to four students. Sixth year. 16 hours. ULRICH.

110. STUDIES IN METABOLISM, CLINICAL AND EXPERIMENTAL. Limited to six students. Sixth year. 48 hours. ROWNTREE and Staff.

## DIVISION OF NERVOUS AND MENTAL DISEASES

### REQUIRED COURSES

75. NEUROLOGY AND NEUROLOGIC DIAGNOSIS. The general symptomatology and methods of examination of the nervous system; the etiology, pathology, diagnosis and treatment of the special diseases of the nervous system. Lectures, recitations and lantern demonstrations. Fifth year. 24 hours. HAMILTON, HAMMES.

76. PSYCHIATRY. The principal data and methods of modern psychiatry, with the diagnosis and treatment of the various mental disorders. Lectures, recitations and demonstrations. Prerequisite: Course 75. Fifth year. 16 hours. HAMILTON.

77a,b. CLINICAL NEUROLOGY AND PSYCHIATRY. Section clinics in nervous and mental diseases, conducted at the University Hospital, the Minneapolis City Hospital, and the City and County Hospital, St. Paul. Fifth year. 20 hours. HAMILTON, HAMMES, MORRISON, WOLTMANN.

79a,b. ADVANCED SECTION CLINICS conducted at the above hospitals throughout the year. Sixth year. 20 hours. HAMILTON, HAMMES.

81a,b. PERSONAL OBSERVATION AND STUDY of cases of nervous and mental disease in the University Out-patient Service. In sections. Sixth year. 12 hours. MORRISON, WOLTMANN.

### ELECTIVE COURSES

119. PATHOLOGY OF THE NERVOUS SYSTEM. The exhibition of gross and microscopic preparations of diseased nerve tissues; the relations existing between pathologic lesions and signs and symptoms; the chief neurone systems and the principles underlying their degeneration. Limited to four students. Prerequisites: Courses 75 and 76. Sixth year. 8 hours. HAMILTON, WOLTMANN.

121. ORGANIC NERVOUS DISEASES. Advanced diagnosis of nervous diseases, with a view of giving each student practical experience in all

the chief diagnostic procedures employed in the study of nervous diseases. Limited to four students. Prerequisites: Courses 75 and 76. Sixth year. 16 hours. HAMILTON.

122. SYPHILITIC NERVOUS AFFECTIONS. The diagnosis and treatment of the expressions of syphilis in the central nervous system, combining clinical and laboratory teaching and referring particularly to dementia paralytica and tabes dorsalis. Limited to six students. Sixth year. 16 hours. HAMMES.

124. REGIONAL DISEASES. A didactic and clinical conference on the regional diagnosis of lesions of the nervous system. Limited to four students. Third quarter, sixth year. 8 hours. MORRISON.

### DIVISION OF DERMATOLOGY

#### REQUIRED COURSES

91. COURSE IN DERMATOLOGY. A descriptive study of the common skin diseases and of syphilis, including diagnosis and treatment. Lectures and demonstrations. Sixth year. 16 hours. SWEITZER.

93a,b. CLINICAL DERMATOLOGY. Section clinics conducted at the Minneapolis City Hospital and the City and County Hospital, St. Paul. Sixth year. 12 hours. SWEITZER, BUTLER, IRVINE, ARMSTRONG, COOK.

95a,b. CLINIC IN DERMATOLOGY. The practical study of cases of skin and syphilitic disease, in the Out-patient Service. Sixth year. 12 hours. SWEITZER, BUTLER, IRVINE.

#### ELECTIVE COURSES

137a,b. CLINIC IN DERMATOLOGY. An elective course in the study of selected cases of skin and syphilitic diseases, at the Out-patient Department. Limited to eight students. Sixth year. 36 hours. SWEITZER, BUTLER, IRVINE.

139a,b. WARD CLINICS IN DERMATOLOGY. Conducted in the City and County Hospital, St. Paul. Limited to ten students. Fifth or sixth year. 12 hours. ARMSTRONG, COOK.

## THE DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

Professor JENNINGS C. LITZENBERG; Associate Professors JOHN L. ROTHROCK, FRED L. ADAIR; Instructors WILLIAM H. CONDIT, RAE T. LAVAKE, CLARENCE O. MALAND, JALMAR SIMONS; Assistants L. W. BARRY, JAMES F. HAMMOND, WILLMAR C. RUTHERFORD, FREDERICK J. SOUBA; Teaching Fellow S. E. MOORE.

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Departmental Office, Institute of Anatomy

**REQUIRED COURSES**

51a,b. OBSTETRICS. The physiology and pathology of pregnancy, parturition and the puerperium. Lectures and recitations. Fifth year. 64 hours.. ADAIR, CONDIT.

53. GYNECOLOGY. Course in gynecologic diagnosis. Fifth year. 16 hours. LITZENBERG.

55a,b. CLINICS IN OBSTETRICS AND GYNECOLOGY. Sections of the class at the Minneapolis City Hospital, City and County Hospital, St. Paul. Fifth year. 10 hours. ROTHROCK AND RUTHERFORD; ADAIR AND SIMONS, and Assistants.

57a,b. OBSTETRICS. A study of the pathology of pregnancy and parturition and of the puerperium. Sixth year. 32 hours. LITZENBERG.

59a,b. GYNECOLOGY. A study of the diseases of women. Sixth year. 32 hours. LITZENBERG.

61. CASE ANALYSIS IN OBSTETRICS AND GYNECOLOGY. A course in the analytical study of cases. Sixth year. 16 hours. LITZENBERG.

63a,b. OPERATIVE OBSTETRICS. Operations demonstrated upon the patient and the manikin. Sections. Sixth year. 8 hours. LITZENBERG, CONDIT, LAVAKE.

65a,b. CLINIC IN OBSTETRICS AND GYNECOLOGY. Demonstrations, diagnosis, and treatment of cases in the Out-patient Department. Sections of class, sixth year. 12 hours. ADAIR and Assistants.

67a,b. CLINICS IN OBSTETRICS AND GYNECOLOGY. Demonstrations, diagnosis and treatment of cases. Conducted in Minneapolis City Hospital and City and County Hospital, St. Paul. Sections of class, sixth year. 24 hours. ROTHROCK, ADAIR, SIMONS and Assistants.

69a,b. CLINICAL CLERKSHIPS. The personal and direct observation of patients in hospital, under supervision; the taking and recording of case histories; the making of provisional diagnoses. Sixth year, in sections. 32 hours. LITZENBERG and Associates.

71a,b. PARTURITION CLINICS. Conducted in the University Hospital and the Out-patient service, at the Minneapolis City Hospital and the City and County Hospital, St. Paul. Students are on call for parturition cases; attendance required. No credits. Fifth and sixth years. LITZENBERG, ADAIR, SIMONS, LAVAKE and Assistants.

ELECTIVE COURSES

101a,b. SEMINAR IN OBSTETRICS. Offering opportunities of advanced study. Limited to eight students. Sixth year. 16 hours. LITZENBERG.

103a,b. SEMINAR IN GYNECOLOGY. Offering opportunities in advanced

study in gynecology. Limited to eight students. Sixth year. 16 hours. LITZENBERG.

105a,b. SPECIAL CLINICAL COURSE. A study in the diagnosis and treatment of diseases of women and of obstetrical conditions, at the Outpatient Department. Limited to four students. Sixth year. 36 hours. CONDIT and LAVAKE.

106. OBSTETRIC AND GYNECOLOGIC PATHOLOGY. Limited to six students. Fifth or sixth year. 24 hours. ADAIR.

109. GYNECOLOGICAL CLINIC. A study in the diagnosis and treatment of diseases of women. Conducted in the St. Paul Dispensary. Two students. Sixth year. 16 hours. ROTHROCK.

111a,b. CLINIC IN GYNECOLOGY AND OBSTETRICS. Bedside clinic at the Minneapolis City Hospital. Fifth or sixth year. Four students. 12 hours. MALAND.

113. CLINIC IN GYNECOLOGY AND OBSTETRICS. Course same as 111. SIMONS.

115. APPLIED ANATOMY OF THE PELVIS. Fifth year. Eight hours. LAVAKE.

## THE DEPARTMENT OF PEDIATRICS

Professor JULIUS PARKER SEDGWICK; Associate Professor WALTER R. RAMSEY; Assistant Professor FREDERIC W. SCHULTZ; Instructors BRONSON CROTHERS, EDGAR J. HUENEKENS, FREDERICK C. RODDA; Assistants WILLIAM D. BEADIE, TOBIAS L. BIRNBERG, JOSEPH A. HEDDING, RALPH T. KNIGHT, HENRY A. LYSNE, CHARLES E. SMITH; Teaching Fellow ROOD TAYLOR.

Departmental Office, Millard Hall

### REQUIRED COURSES

101-102. DISEASES OF CHILDREN. The etiology, pathology, diagnosis and treatment of diseases peculiar to, or distinctive in children, with particular emphasis upon their differences from adult types. Fifth year. 56 hours. SEDGWICK, RAMSEY.

102a,b. CLINIC IN PEDIATRICS. Conducted at the University Hospitals, the Minneapolis City Hospitals, Lymanhurst, and the City and County Hospital, St. Paul. Sections of class, fifth year. 16 hours. SEDGWICK, SCHLUTZ, RAMSEY, HUENEKENS, RODDA.

103a,b. CLINIC IN CONTAGIOUS DISEASES. Conducted in the Minneapolis City Hospital and the City and County Hospital, St. Paul. Sections of class, fifth year. 16 hours. RAMSEY, HUENEKENS, RODDA and Assistants.

104a,b. CLINIC IN PEDIATRICS. An advanced clinical course, conducted at

the University Hospital and affiliated hospitals. Sections of class, sixth year. 8 hours. SEDGWICK, RAMSEY, SCHLUTZ, RODDA, HUENEKENS, TAYLOR.

105a,b. OUT-PATIENT PEDIATRIC CLINIC. The practical study of the diseases of children in the Out-patient service. Sections of class, sixth year. 12 hours. SCHLUTZ, HUENEKENS, TAYLOR and Assistants.

ELECTIVE COURSES

111. DISEASES OF THE NEW-BORN. The pathology and treatment of these disorders, with the presentation of illustrative cases. Limited to six students. Fifth or sixth year. 16 hours. SEDGWICK, TAYLOR.

112. NERVOUS DISEASES OF CHILDREN. The functional nervous disorders of childhood, with the observation and practice of electrical reactions in normal and abnormal children. Limited to six students. Fifth or sixth year. 16 hours. SEDGWICK.

113. CONTAGIOUS DISEASES. The advanced study of contagious diseases, including the practice of intubation and tracheotomy, with training upon the cadaver. Fifth or sixth year. 16 hours. RAMSEY.

114. COURSE IN INFANT FEEDING. Conducted at the St. Paul Baby Welfare Clinic of the H. Amherst Wilder Charity. Sixth year. 24 hours. RAMSEY.

115a,b. THEORY AND PRACTICE OF INFANT FEEDING, INCLUDING DISEASES OF THE GASTRO-INTESTINAL TRACT. Limited to six students. In first three quarters, sixth year; in fourth quarter, fifth year. 8 hours. SCHLUTZ.

117a,b. CONGENITAL DEFECTS AND CONSTITUTIONAL DISORDERS OF INFANCY AND CHILDHOOD. Limited to six students. In each quarter. Fifth or sixth year. 8 hours. SCHLUTZ.

119a,b. INFANT FEEDING. A course of study conducted at the Pillsbury Settlement House. Limited to four students. Sixth year. 8 hours. HUENEKENS.

121a,b. PEDIATRIC CLINIC, OUT-PATIENT DEPARTMENT. Limited to six students. Fifth or sixth year. 36 hours. HUENEKENS, SCHLUTZ, RODDA, TAYLOR.

123. SYPHILIS IN CHILDREN. Conducted at the Out-patient Department and at the University Hospital. Limited to four students. Fifth or sixth year. 8 hours. SEDGWICK, TAYLOR.

125a,b. CLINIC IN CONTAGIOUS DISEASES. Conducted at the Minneapolis City Hospital. Limited to four students. Sixth year. 16 hours. SCHLUTZ.

127a,b. CLINIC IN CONTAGIOUS DISEASES. Conducted at the City and County Hospital, St. Paul. Limited to ten students. Course re-

peated in each quarter. Fifth or sixth year. 12 hours. RAMSEY, BIRNBERG.

## DEPARTMENT OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

Professor FRANK C. TODD; Associate Professor WILLIAM R. MURRAY; Assistant Professors FRANK E. BURCH, JOHN S. MACNIE, HORACE NEWHART; Instructors HOWARD S. CLARK, WILLIAM W. LEWIS, FRED J. PRATT; Assistants CHAS. W. FOGARTY, STANLEY E. KERRICK, JOHN W. LEE, THOMAS J. MALONEY, MARGARET I. SMITH, H. JOURNEAY WELLES; Teaching Fellows HENRY E. BINGER, SAMUEL T. FORSYTHE; Graduate Scholar HENRY J. FRIESEN.

Departmental Office, Millard Hall

### REQUIRED COURSES

79. OPHTHALMOLOGY AND OTOLOGY. Disorders and diseases of the eye and ear and their corrective, medical and surgical treatment. Sixth year. 32 hours. TODD.

81. RHINOLOGY AND LARYNGOLOGY. The diagnosis and treatment of diseases of the nose and throat. Sixth year. 16 hours. MURRAY.

83a,b. SECTION CLINICS IN EYE, EAR, NOSE, AND THROAT. Diagnostic and operative procedures in the clinics of the University Hospital, the Minneapolis City Hospital, and the City and County Hospital, St. Paul. Sixth year. 28 hours. TODD, BURCH, MURRAY, LEWIS.

85a,b. SECTION CLINIC IN DISEASES OF THE EYE. Study and treatment of cases in the Out-patient service, at three weekly sessions. Sixth year. 12 hours. MACNIE, CLARK and Assistants.

87a,b. SECTION CLINIC IN DISEASES OF THE EAR. Study and treatment of cases in the Out-patient service, at three weekly sessions. Sixth year. 12 hours. NEWHART and Assistants.

89a,b. SECTION CLINIC IN DISEASES OF THE NOSE AND THROAT. Study and treatment of cases in the Out-patient service, at three weekly sessions. Sixth year. 12 hours. MURRAY, PRATT and Assistants.

### ELECTIVE COURSES

115a,b. CLINIC IN DISEASES OF THE EYE. The examination of patients, diagnosis of disease conditions and supervised treatment. Alternate days, in the Out-patient Department. Sixth year. 36 hours. MACNIE and Assistants.

117a,b. CLINIC IN DISEASES OF THE EAR. Studies in examination of cases,

diagnosis, and supervised treatment. Alternate days, at the Out-patient Department. Sixth year. 12 hours. NEWHART and Assistants.

119a,b. CLINIC IN DISEASES OF THE NOSE AND THROAT. The examination of patients, diagnosis of disease conditions and supervised treatment. Alternate days, at the Out-patient Department. Sixth year. 24 hours. MURRAY, PRATT and Assistants.

121a,b. OPERATIVE CLINICS IN EYE, EAR, NOSE AND THROAT. Conducted at the University Hospital. Course repeated in each quarter. Limited to ten students. Sixth year. 16 hours. TODD, BURCH, PRATT.

123. REFRACTION. A course of lectures. Required of all desiring the practical course 125a,b. Sixth year. 8 hours. BURCH.

125a,b. PRACTICAL COURSE IN REFRACTION. Limited to ten students. Prerequisite: Course 123. Sixth year. 36 hours. BURCH, LEE.

126. OPHTHALMOSCOPY. The principles and practice of this method of examination of the eye. Sixth year. 16 hours. MACNIE, PRATT.

127a,b. CLINIC IN DISEASES OF THE EYE. City and County Hospital, St. Paul. Limited to ten students. Fifth or sixth year. 36 hours. LEWIS.

201-202. SEMINAR IN OPHTHALMOLOGY AND OTO-LARYNGOLOGY. Sixth year. 48 hours. Staff.

## THE DEPARTMENT OF SOCIAL SERVICE

Director, MARION A. TEBBETS

### ELECTIVE COURSE

101. MEDICAL SOCIAL SERVICE. A study of inter-related physical, social and industrial conditions affecting the individual health and demanding the service of the physician. The origin and purpose of medical social service. The social factors in household, industrial and communal health. The community's health resources. Special medico-social problems. Lectures and laboratory field work. Limited to ten students. Offered in fifth or sixth year. 48 hours. TEBBETS, BEARD.

## THE SCHOOL OF CHEMISTRY

Professor GEORGE B. FRANKFORTER: Assistant Professors IRA H. DERBY, WILLIAM H. HUNTER; Instructor WOLF KRITCHEVSKY.

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(Contributing courses to The Medical School.)

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13-14. MEDICAL ORGANIC CHEMISTRY. An outline of the chemistry of carbon, including the preparation of some of the more important or-

ganic compounds. Special emphasis is laid on the parts of organic chemistry most important in medicine. For third year medical students who have not completed organic chemistry in the pre-medical years. 208 hours; six credits. HUNTER, KRITCHEVSKY and Assistants.

91. PHYSICAL CHEMISTRY. Special attention will be given to those divisions of the subject which have most application in the science of medicine, such as osmosis, colloidal solutions, chemical equilibria, etc. Third year medical students. Two hours lectures; four hours of laboratory work, weekly. 96 hours; four credits. DERBY.

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NOTE: For information regarding other available courses in Chemistry, see Bulletin, School of Chemistry.

## DEPARTMENT OF PHYSICS

174. RADIOACTIVITY AND ROENTGEN RAYS. Experimental and descriptive lectures and exercises on the radioactive substances and their radiations; discharge of electricity through gases; cathode rays; Roentgen rays. Two lectures and one laboratory period each week during the semester. Primarily for medical students. Fourth, fifth and sixth years. Three credits. 64 hours. KOVARIK.

Supplement to the Bulletin of the Medical School of the University of Minnesota, Volume XIX, No. 8, issued June 1916,

# MAKING THE RIGHT START

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**1916**

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# MAKING THE RIGHT START

For the student who has decided to study medicine the first and most important step is the selection of a medical school; a false step here may handicap him for life. Fortunately never before has there been available so much reliable information to guide him.

Before choosing a medical school the student should obtain information on several important points; its requirements of preliminary education; the character of its teaching; whether or not its diplomas are recognized in all states, and the tuition fees charged.

### ADEQUATE ENTRANCE QUALIFICATIONS

Low entrance requirements by a medical school may attract some students. It is important, however, for the student to make sure that his preliminary education is sufficient to meet the requirements of the state licensing boards of the country. He should know that at the present time, seventeen[1] state licensing boards require that before beginning the study of medicine the student must have completed two years of work in a college of liberal arts, in addition to a four-year high school education, and that the boards of sixteen other states[2] require at least one year of such preliminary college preparation. Although he may not at first be seeking a license in one of these twenty-eight states, he may later miss a great opportunity by being thus debarred. He should know also that all the better medical colleges[3] now require this higher preliminary education since—most important of all—the student needs it to grapple intelligently with the difficult and complex subjects of the modern medical course. Lower entrance requirements by any medical college therefore, should be regarded as an indication that the medical training furnished will be correspondingly low.

### BETTER MEDICAL TRAINING ESSENTIAL

A generation or two ago almost any medical course was adequate to cover the medical knowledge of the time. Not so at present Modern medicine is based on scientific knowl-

1. These states are Alabama, Arizona, Colorado, Indiana, Iowa, Maryland, Minnesota, New Hampshire, New Jersey, New Mexico, North Dakota, Oklahoma, Rhode Island, South Dakota, Virginia, Washington and Wisconsin.
2. These states are Arkansas, California, Connecticut, Illinois, Kansas, Kentucky, Louisiana, Michigan, Mississippi, North Carolina, Pennsylvania, Tennessee, Texas, Utah, Vermont and West Virginia.
3. Listed on page 19.

edge and without this knowledge the physician of the future will be a failure. Adequate instruction in medicine can now be given only by expert teachers, with well-equipped laboratories, and in connection with dispensaries and hospitals which provide an abundance of clinical material.

### IS THE MEDICAL COLLEGE RECOGNIZED?

Formerly a course in almost any medical college furnished an adequate qualification for the license to practice medicine in all states. This has also been changed. At the present time state licensing boards are making more use of their power to discriminate between medical colleges and to refuse recognition to those which are deemed not properly qualified to furnish a training in modern medicine. Diplomas from those not recognized, therefore, do not constitute acceptable qualifications for the license to practice medicine in such states. The student must make sure not only that he has adequate preliminary education, but also that he has secured his medical training in a college which is recognized in all states. See Table 2 in back of this pamphlet.

### CONSIDER CAREFULLY THE COST

The student is, of course, bound to consider the expense of his medical training, and herein lies the bait by which some inferior colleges which profess deep interest in "the poor boy" endeavor to attract students. If the training is not thorough and up to date, the student should know that the training furnished will be a mighty poor investment at any price. As a matter of fact, and as may be noted in Table 1, in the back of this pamphlet, the total fees charged by many of the best (Class A) medical colleges, particularly the medical departments of some state universities, are lower than those charged by some of the poorly equipped proprietary (Class C) institutions. In the same length of time, therefore, and often for even lower fees than he would pay in a poorly equipped institution, the student may acquire his education in one of the best medical colleges of the land. If some of the better schools do charge higher fees, they spend on each student per year several times the amount of money that the student pays for tuition. This they are able to do because of endowments or state aid. It would be poor economy, therefore, for one to enter a low-grade college which depends on students' fees alone for its income, and whose diplomas are not recognized in from twenty to thirty-three states, when for a few additional dollars each year one can enter a thoroughly equipped institution, receive a far better medical training and obtain a diploma recognized everywhere. Even if one should be required to work one's way through, in whole or in part, the opportunities for doing so are usually greater in the better than in the lower standard colleges. As a rule,

however, it is the student who works his way through who appreciates not only the value of money, but also the value of the medical course he is getting. It is not surprising, therefore, that many such students are found in the high-grade medical colleges. There are now about 300 free scholarships, as well as generous loan funds, available for deserving students in the better medical colleges.

### GET RELIABLE INFORMATION

How may the student secure reliable information on these matters? Some medical colleges advertise extensively in newspapers and popular magazines and through announcements and circulars containing glowing, if not misleading, statements. At present certain medical schools are being thus advertised, even though their diplomas are not recognized in from twenty-five to thirty-two states![4] It is hardly to be expected that the announcements sent out by these schools will contain the information which the prospective medical student most needs. It is essential, therefore, that he should secure information from impartial and reliable sources, so as to make sure he is not enticed into a low-grade institution and find on graduation that his diploma has but limited value. To inform himself thoroughly, therefore, he should secure the announcements of a number of colleges and study these. But, at the same time, he should read the revised reports on medical colleges published from time to time in The Journal of the American Medical Association by the Council on Medical Education, which can be obtained in reprint form. After extensive and repeated investigations the medical schools of the country have been rated by the Council in three classes, namely, A, B and C. If the student is otherwise in doubt, he will not make a mistake by choosing one of the colleges in Class A. If he has earned his diploma at a college in the higher classification which required for admission two years of college work, in addition to a four-year high school education, there is no doubt regarding either the quality of the training obtained or his eligibility after graduation to obtain a license in any state he may choose.

### A STRONG AND SURE FOUNDATION

In his preliminary and medical education the student should bear in mind that he is laying the foundation for the rest of his life. If he finds that additional preliminary education is needed to enter one of the better medical colleges, he should consider the time well spent, since he is all the more sure of having laid a solid foundation.

4. For table showing in what states diplomas granted by the various medical colleges are not fully recognized, see Table 2, in back of this pamphlet.

Although the medical profession in this country is overcrowded, there is always room for the thoroughly competent. On the other hand, disappointed indeed will he be if because of lower entrance requirements or other allurements he is induced to get his training in a poorly equipped college and finds after graduation that his diploma is not recognized in many states and that otherwise he is handicapped for life.

## FEWER BUT BETTER PHYSICIANS

Fifteen years ago a noted educator,[5] who was thoroughly familiar with the conditions underlying medical education, made the terse remark, "We do not need more doctors, we need more doctor." Statistics published this year show that this need is being attained. Fifteen years ago this country had 162 medical colleges, which was over half of the world's supply. And such colleges! Although some of them were well equipped and well conducted, a large proportion were owned by joint stock corporations, or by individuals, and were conducted solely for the profit of these owners. A professorship could be secured by any physician who bought a certain amount of stock, or for a smaller amount he could secure a lectureship. In this transaction, his ability as a teacher was given little consideration. Since these institutions were organized for profit, it was important to secure large classes so the income from fees would be correspondingly increased. Glowing advertisements, follow-up letters and paid solicitors were freely used, and as a result enrolments were swelled to mammoth proportions. No wonder that the actual number of students in that year reached the amazing total of 28,142 and that there were 5,747 graduates!

### QUANTITY GIVES WAY TO QUALITY

In these fifteen years there has been a marked improvement; there are fewer medical colleges by nearly 50 per cent.; there are fewer medical students and fewer medical graduates by nearly 40 per cent. Instead of there being 162 medical colleges, including a lot of stock corporations, sans teachers, sans laboratories and sans ideals, there are now only ninety-five, but most of them are thoroughly equipped, having fair entrance standards, skilled teachers, modern laboratories and an abundance of clinical material. The sum total of colleges has decreased, but the number of better ones has decidedly increased.

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5. "The Contribution of Our Higher Schools to the Life of the Nation," President William H. P. Faunce of Brown University, at the Thirty-Ninth University Convention of the State of New York, July 1-3, 1901, Regents' Bulletin, September, 1901, p. 404.

Instead of a great army of students enrolled fifteen years ago, many of whom did not have even a grammar school education and who were enticed from more fitting occupations by the glowing advertisements of the medical colleges, we now have about half the number but practically all have had a preliminary training which has enabled them to better understand the complex problems of modern medicine. As to the opportunities for properly equipped medical students, these have not been diminished, but have been decidedly improved. Statistics show that there could be a further reduction in the number of colleges and still allow of a greatly increased student enrolment. And the students would be further benefited by the change, since a greater proportion would be in the better equipped colleges.

As to the reduction in the number of graduates, surely this country needed "fewer doctors, but more doctor!" It is certainly far better to have a hundred well-trained graduates from modern high-grade medical schools than a thousand who would graduate from the old-time variety of run-for-profit institutions. The most important point is that at present the public is being furnished each year with better trained physicians.

That the reduction will lead to a dearth of physicians appears ridiculous to anyone acquainted with the facts. The annual number of graduates is still nearly double the loss of physicians by death; and even if it were less than the annual loss, it would be many years before a dearth would result because of the seriously overcrowded condition of the profession. In this country there is a physician to every 690 people, as compared with one physician to every 1,500 to 2,500 in the leading nations of Europe.

The situation is simply this: a large oversupply of exceedingly low-grade medical colleges, with their enormous output of poorly educated doctors, has given way to a more normal quantity of high-grade educational institutions, which are turning out annually a still comparatively large number of thoroughly trained physicians. The change is certainly beneficial to the public.

# STANDARDS OF THE COUNCIL ON MEDICAL EDUCATION OF THE AMERICAN MEDICAL ASSOCIATION

## Essentials of an Acceptable Medical College

(Revised to Aug. 1, 1916)

The following outline of the essentials of an acceptable medical college was issued by the Council on Medical Education of the American Medical Association for its suggestive value in the rapid development in progress in the medical colleges of the United States. It also represents the basis on which medical colleges are rated in the Council's classifications.

### ADMISSION OF STUDENTS

1. A strict enforcement of the following standards and requirements, the college itself to be held responsible for any instances in which they are not enforced.

Note.—Since the product of the medical school depends largely on the quality of the students admitted, in rating medical colleges, special emphasis is laid by the Council on the strictness and honesty by which the standards of admission and advanced standing are administered. By the admission of unfit students the school is handicapped from the very beginning and, in the opinion of the Council, deserves a low rating regardless of its equipment, its clinical facilities and its teaching force.

2. A requirement for admission by the medical school of a four-year high school education, and in addition at least one year of college work, and, after Jan. 1, 1918, two years of college work. This premedical college work must have been taken in a college of arts and sciences approved by the Council or in lieu thereof the student must have an equivalent education as demonstrated by an examination approved by the Council.

### I. HIGH SCHOOL REQUIREMENTS

(a) For admission to the preliminary college year, students must have completed *a four-year course of at least fourteen units* in a standard accredited high school or other institution of standard secondary school grade, or have its equivalent as demonstrated by an examination conducted by a duly authorized examiner of the College Entrance Examination Board, or by the authorized examiner of a standard college or university who has been approved by the Council on Medical Education, or by an examiner whose certificates are accepted by such approved standard colleges or universities. *A detailed statement of attendance at the secondary school, and a transcript of the student's work should be kept on file by the medical school authorities.* This evidence of actual attendance at the secondary school or schools should be obtained for every student no matter whether he is admitted to the freshman or to advanced classes.

(b) The subjects for which credits for admission to the preliminary college year may be accepted are shown in the accompanying schedule.

## II. PRELIMINARY COLLEGE WORK

(c) Until Jan. 1, 1918, the minimum requirement for admission to acceptable medical schools, in addition to the high

### SCHEDULE OF SUBJECTS OFFERED IN ACADEMIC AND SECONDARY SCHOOLS, CREDITS IN WHICH ARE ACCEPTABLE FOR ENTRANCE TO THE PRE-MEDICAL COLLEGE COURSES

| Subjects | Units | Required | Elective |
|---|---|---|---|
| ENGLISH LITERATURE AND COMPOSITION | 3-4 | 3 | 1 |
| MATHEMATICS | | | |
| Elementary algebra | 1 | 1 | .. |
| Advanced algebra | ½-1 | .. | ½-1 |
| Plane geometry | 1 | 1 | .. |
| Solid geometry | ½ | .. | ½ |
| Trigonometry | ½ | .. | ½ |
| LATIN | 1-4 | * | 1-4 |
| Greek | 1-3 | * | 1-3 |
| FRENCH | 1-4 | 2* | 1-4 |
| GERMAN | 1-4 | 2* | 1-4 |
| Other Foreign Languages | 2 | .. | 2 |
| HISTORY | | | |
| Ancient history | 1 | ** | 1 |
| Medieval and modern history | 1 | ** | 1 |
| English history | ½-1 | ** | ½-1 |
| American history | ½-1 | ** | ½-1 |
| Civil government | ½-1 | ** | ½-1 |
| SCIENCE † | | | |
| Botany | ½-1 | .. | ½-1 |
| Zoology | ½-1 | .. | ½-1 |
| Chemistry | 1 | .. | 1 |
| Physics | 1 | .. | 1 |
| Physiography | ½-1 | .. | ½-1 |
| Physiology | ½-1 | .. | ½-1 |
| Astronomy | ½ | .. | ½ |
| Geology | ½-1 | .. | ½-1 |
| Agriculture | 1-2 | .. | 1-2 |
| Bookkeeping | 1 | .. | 1 |
| Business Law | ½ | .. | ½ |
| Commercial geography | ½-1 | .. | ½-1 |
| Domestic science | 1-2 | .. | 1-2 |
| Drawing, freehand and mechanical | ½-2 | .. | ½-2 |
| Economics and economic history | ½-1 | .. | ½-1 |
| Manual training | 1-2 | .. | 1-2 |
| Music: Appreciation or harmony | 1-2 | .. | 1-2 |

A *unit* is the credit value of at least 36 weeks' work of 4 or 5 recitation periods per week, each recitation period to be of not less than 40 minutes. In other words, a unit represents a year's study in any subject in a secondary school constituting approximately a quarter of a full year's work. A satisfactory year's work in any subject cannot be accomplished under ordinary circumstances in less than 120 sixty-minute hours, or their equivalent.

*Required Branches:* Of the 14 units of high school work it is suggested that the subjects in capitals aggregating 8 units be required. Other work to the amount of at least 7 units may be made up from any of the other subjects of the above schedule.

* Two units of Greek or Latin may be substituted for the two required units of French or German.

** One unit of history and civics prescribed.

† Credentials of each science course must include evidence of laboratory work.

school work specified above, is one year of collegiate work, extending through thirty-two weeks and covering thirty semester hours[1] which must have been completed by the student before he is eligible for admission. This college work should include courses of at least eight semester hours each in physics, chemistry and biology, including laboratory work. It is urged that the student obtain a reading knowledge of a modern language, preferably French or German. These subjects and the amounts required are shown in the accompanying schedule.

SCHEDULE

| Subject | Lectures or Recitations per Week | Laboratory Periods* per Week | Total Hours per Semester | Total Semester Hours per Year |
|---|---|---|---|---|
| Physics, 1..... | 2 or 3 | 2 or 1 | 4 | 8 |
| Chemistry, 1..... | 2 | 2 | 4 | 8 |
| Biology, 1..... | 2 or 3 | 2 or 1 | 4 | 8 |
| Elective, preferably French or German, 2..... | 4 or 3 | ..... | 4 or 3 | 8 or 6 |
| Totals..... | 9 or 11 | 6 or 5 | 16 or 15 | 32 or 30 |

* Each laboratory period must extend at least two hours.

ENTRANCE CONDITIONS

(d) A student may be admitted with certain subject conditions provided he has completed at least one year [thirty semester hours, see paragraph (c)] of work in an approved college of liberal arts or science, provided *no conditions may be permitted in the prescribed eight semester hours of college chemistry.* These conditions may be either in (1) or (2), but not in both: (1) In one-half (four semester hours) of the required course in physics, or, (2) in one-half of the required course in biology (four semester hours), or in zoology (three semester hours). These conditions must be removed before the beginning of the work of the second medical year and the credits for these conditions must be in addition to the required thirty semester hours.

(e) A candidate who has completed two or more years of work in an approved college of liberal arts, or science, may be admitted conditioned in all of the required work in physics, or one-half of the work required in biology, to a total not to exceed eight semester hours. These conditions must be removed before the beginning of the second medical year. No condition may be permitted in the prescribed eight semester hours of college chemistry.

After Jan. 1, 1918, the minimum requirement for admission to acceptable medical schools will be two years (sixty semester hours) of work in a college of arts and sciences approved by the Council on Medical Education or its actual educa-

1. A semester hour is the measurement of work represented by one class period per week for half of the college year. Each laboratory period to be so valuated must extend over at least two hours.

tional equivalent as demonstrated by an examination approved by the Council. It is suggested that in addition to the courses outlined in the preceding paragraph, this two year course include a course in organic chemistry, a second year of biology and more work in the modern language unless the student already possesses a reading knowledge of it.

APPROVED COLLEGES OF ARTS AND SCIENCES

3. (a) A list of colleges of arts and sciences approved by the Council on Medical Education will be prepared and published from time to time. By an approved college (of arts and sciences) is meant one whose standing has been vouched for by some standardizing agency in whose methods the Council has confidence. To be recognized a college must have sufficient scientific equipment and maintain laboratories in the premedical sciences. It must have ample endowment to maintain a sufficient corps of teachers. Membership in some national organization or association of colleges will be favorably regarded by the Council and, in the absence of such membership, careful investigation will be made of the causes of exclusion.

(b) An approved college must also maintain national standards for admission to its freshman class. Students must be required to complete a four-year high school course, and the requirements for admission to the premedical course must be fully equal to the requirements for the regular B. S. course of the college. The admission of students must be in the hands of a responsible committee or examiner whose records shall always be open for inspection. Documentary evidence of the students' preliminary education should be obtained and kept on file. Particular attention will be given to the character of high schools from which certificates are received. Colleges should recognize only certificates from high schools approved by commissions or boards of associations of colleges and secondary schools or other agencies approved by the Council. When such endorsement is lacking the college should be slow in accepting certificates without the support of entrance examinations. Undue liberality in the acceptance of certificates from secondary schools unendorsed by approved standardizing agencies will be registered by the Council as a failure to comply with its requirements and the college will be dropped from the approved list.

(c) Unless the university examiner and his records are closely accessible, the medical school should obtain and keep on file documentary evidence of all students' preliminary education including both high school and collegiate work. It is particularly important that the records show that the required amount of work in the premedical sciences, including laboratory exercises, has been completed.

(d) Premedical college courses given in or by medical schools, or advance years taken in high schools, will not be considered as acceptable unless they have been investigated and approved by some association of colleges and secondary schools or other approved agency having to do with the standardizing of liberal arts colleges

MEDICAL SCHOOL REQUIREMENTS

4. The college should require that students be in actual attendance in the college *within the first week* of each annual session and thereafter.

5. Actual attendance at classes should be insisted on except for good cause, such as for sickness, and under no circumstances should credit be given for any course where the attendance has been less than 80 per cent. of the full time.

6. (a) Full advanced standing may be granted to students only for work done in other acceptable colleges, and in granting advanced standing there should be no discrimination against the college's full-course students. (b) In *exceptional cases* students from Class B medical schools may be given advanced standing but not higher than *entrance* to the third year (junior) class, and no credit should be given in any subject except on recommendation of the head of the department teaching that subject. (*c*) In *exceptional cases* students from Class C colleges may be given advanced standing but not higher than *entrance* to the second year (sophomore) class, and then only after thorough examinations in all first year subjects have been passed.

SUPERVISION, EQUIPMENT, TEACHERS

7. There should be careful and intelligent supervision of the entire school by a dean or other executive officer who holds, and has sufficient authority to carry out fair ideals of medical education as determined by modern knowledge.

8. There should be a good system of records showing conveniently and in detail the credentials, attendance, grades and accounts of the students by means of which an exact knowledge can be obtained regarding each student's work. Records should also be kept showing readily the attendance of patients at the teaching hospitals and dispensaries; the maternity cases attended by students, and the postmortem cases used in teaching.

9. The college should have a fully graded course covering four years of at least thirty-two weeks each, exclusive of time required for matriculation and holidays, and at least thirty hours per week of actual work; this course should be clearly set forth in a carefully prepared and printed schedule of lectures and classes.

(*a*) The college should give two years of work consisting largely of laboratory work in thoroughly equipped laboratories in anatomy, histology, embryology, physiology, chemistry (inorganic, organic and physiologic), bacteriology, pathology, pharmacology, therapeutics and clinical diagnosis. Present-day medical knowledge makes it essential that these subjects be in charge of full-time, well-trained teachers.

(*b*) Two years of clinical work largely in hospitals and dispensaries, with thorough courses in internal medicine (including physical diagnosis, pediatrics, nervous and mental diseases), surgery (including surgical anatomy and operative surgery on the cadaver), obstetrics, gynecology, laryngology, rhinology, ophthalmology, otology, dermatology, hygiene and medical jurisprudence.

(*c*) As soon as conditions warrant, a fifth undergraduate year should be required which should be spent by the student as an intern in an approved hospital.

10. The college should provide at least ***six expert, thoroughly trained professors*** in the laboratory branches, salaried so that they may devote their entire time to instruction and to that research without which they cannot well keep up with the rapid progress being made in their subjects.[2] There should also be a sufficient number of assistants in each department to look after the less important details. For colleges having ***sixty students or less*** in each class, there should be ***at least one full-time salaried assistant each in the departments*** of (*a*) anatomy, (*b*) physiology, (*c*) pathology and bacteriology, and (*d*) physiologic chemistry and pharmacology, and ***one additional assistant in each of these departments should be provided for each additional thirty students enrolled.*** This represents a low average of the full-time assistants already employed by the acceptable medical colleges.

11. The faculty should be thoroughly organized and should be made up of graduates of institutions recognized as medical colleges and who have had a training in all departments of medicine. Nonmedical men should be selected as teachers in medical schools only under exceptional circumstances and only when medical men of equal special capacity are not available. Faculty members should be appointed because of their ability as teachers and not because they happen to be on the attending staff of a hospital or for other like reasons.

### CLINICAL FACILITIES

12. The college should own or entirely control a hospital in order that students may come into close and extended contact with patients under the supervision of the attending staff. This hospital should be in close proximity to the college and have a daily average (for senior classes of 100 students *or less*) of not less than 200 patients who can be utilized for clinical teaching, these patients to be of such character as to permit the student to see and study the common variety of surgical and medical cases as well as a fair number in each of the so-called specialties. In the use of this material it is suggested that ***bedside and ward clinics*** be developed for sections of from five to ten students, and that a certain number of patients in medicine, surgery and the specialties be assigned to each senior student. A well supervised clinical clerk system should also be installed. The treatment and care of these patients should be particularly observed and recorded by the student under

2. These professors should have a definite responsibility in the conduct of the college, and their first and chief interest should be the training of medical students. It is advised that four of these professors be placed in charge of the departments of (*a*) anatomy, (*b*) physiology, (*c*) pathology and bacteriology and (*d*) physiologic chemistry and pharmacology. The other two may be assigned one to the laboratory course in histology and embryology under the department of anatomy and the other to the department of pathology and bacteriology, possibly to the course in laboratory clinical diagnosis.

the strict supervision of the intern, or the attending staff of the hospital.[3]

13. The college should also have ample hospital facilities for children's diseases, contagious diseases and nervous and mental diseases.

14. At least six maternity cases should be provided for each senior student, who should have actual charge of these cases under the supervision of the attending physician. Careful records of each case should be handed in by the student.

15. Facilities should be provided for at least thirty necropsies (for senior classes of 100 students *or less*) during each college session which are attended and participated in by senior students.

16. The college should own or control a dispensary, or outpatient department, the attendance to be a daily average of 100 patients (visits) (for senior classes of 100 students *or less*), the patients to be carefully classified, good histories and records of the patients to be kept and the material to be well used. The attending staff should be made up of good teachers, should be well organized and be regular in attendance.

### OTHER TEACHING FACILITIES AND FINANCES

17. The college should have a working medical library to include the more modern text and reference books with the *Index Medicus* and thirty or more leading medical periodicals; the library room should be properly lighted and heated, and easily accessible to students during all or the greater part of the day; it should be equipped with suitable tables and chairs, and have a librarian in charge.

18. A working medical museum having its various anatomic, embryologic, pathologic and other specimens carefully prepared, labeled and indexed so that any specimen may be easily found and employed for teaching purposes. It is suggested that so far as possible with each pathologic specimen coming from postmortems there also be kept the record of the postmortem, the clinical history of the patient on whom the necropsy was held and microscopic slides showing the minute structures of the disease shown in the gross specimen.

19. There should be sufficient dissecting material to enable each student individually to dissect at least the lateral half of the human cadaver; to provide cross-sections and other demonstration material and to allow of a thorough course for each senior in operative surgery on the cadaver.

20. For modern experimental laboratory work in physiology, pharmacology and bacteriology as well as for a reasonable amount of medical research, a supply of animals—frogs, turtles, rabbits and guinea-pigs, if not also cats and dogs—is essential. Proper provision, also, is necessary for the housing and care of such animals. In any use made of ani-

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3. Suggestions more in detail may be found in the "Report of the Committee on the Reorganization of Clinical Teaching," THE JOURNAL A. M. A., March 6, 1915. Reprint sent on application.

mals great care should be used to prevent needless suffering and work by students should be carefully supervised.

21. A supply of such useful auxiliary apparatus as a stereopticon, a reflectoscope, carefully prepared charts, embryologic or other models, manikins, dummies for use in bandaging, a Roentgen ray and other apparatus now so generally used in medical teaching.

22. The college should show evidences of thorough organization and of reasonably modern methods in all departments and evidences that the equipment and facilities are *being intelligently used* in the training of medical students.

23. A clear statement of the college's requirements for admission, tuition, time of attendance on the classes, sessions, courses offered and graduation should be clearly set forth, together with complete classified lists of its matriculants and latest graduating class in regular annual catalogues or announcements.

24. Statistics show[4] that modern medicine cannot be acceptably taught by a medical school depending solely on the income from students' fees. No medical school should expect to be retained in Class A, therefore, which does not have an annual income of at least $25,000 in addition to the amount obtained from students' fees.

*NOTE.—Correspondence from medical colleges regarding the above requirements is invited, and further suggestions or information available will be gladly furnished.*

### Grading of Medical Colleges

All medical colleges are rated by the Council on Medical Education on a civil service basis on a scale of 1,000 points. The data relating to each college are grouped under ten general heads in such manner that the groups have as nearly equal weight as possible, each group allowing a possible 100 points (10 per cent.) out of a possible 1,000 points (100 per cent.). The ten heads under which the data are arranged are as follows:

1. Showing of graduates before state boards and other evidences of the training received.
2. Enforcement of a satisfactory preliminary educational requirement, granting of advanced standing and the character of the records.
3. Character of curriculum, grading of course, length of session, time allowed for matriculation and supervision.
4. Medical school buildings; light, heat, ventilation, cleanliness.
5. Laboratory facilities and instruction.
6. Dispensary facilities and instruction.
7. Hospital facilities and instruction, maternity work, necropsies, specialties.
8. Faculty, number and qualifications of trained teachers, full-time instructors, and assistants, especially of the laboratory branches, organization, and extent of research work.
9. Extent to which the school is conducted for properly teaching the science of medicine rather than for the profit of the faculty directly or indirectly.
10. Possession and use made of libraries, museums, charts, stereopticons, etc.

Class A colleges are those which are acceptable; Class B, those which, under their present organization, might be made

4. See Medical College Finances, THE JOURNAL A. M. A., April 8, 1916, p. 1115.

acceptable by general improvements, and Class C, those which require a complete reorganization to make them acceptable.

## CLASSIFICATION OF MEDICAL COLLEGES

Revised to Aug. 1, 1916

### CLASS A—ACCEPTABLE MEDICAL COLLEGES

ALABAMA

University of Alabama School of Medicine.....Mobile

CALIFORNIA

Leland Stanford Junior Univ. School of Med..San Francisco
University of California Medical School.....San Francisco

COLORADO

University of Colorado School of Med.....Boulder-Denver

CONNECTICUT

Yale University School of Medicine.....New Haven

DISTRICT OF COLUMBIA

Georgetown University School of Medicine.....Washington
George Washington University Medical School..Washington
Howard University School of Medicine.....Washington

GEORGIA

Atlanta Medical College.....Atlanta
University of Georgia Medical Department.....Augusta

ILLINOIS

Northwestern University Medical School.....Chicago
Rush Medical College (University of Chicago).....Chicago
University of Illinois College of Medicine.....Chicago

INDIANA

Indiana Univ. School of Med.....Bloomington-Indianapolis

IOWA

State University of Iowa College of Medicine....Iowa City
State Univ. of Iowa Coll. of Homeopathic Med....Iowa City

KANSAS

University of Kansas School of Med....Lawrence-Rosedale

KENTUCKY

University of Louisville Medical Department....Louisville

LOUISIANA

Tulane Univ. of Louisiana School of Med....New Orleans

MAINE

Bowdoin Medical School.....Brunswick-Portland

MARYLAND

Johns Hopkins University Medical Department....Baltimore
University of Maryland School of Medicine and
the College of Physicians and Surgeons[5].....Baltimore

5. In 1915 the University of Maryland School of Medicine and the College of Physicians and Surgeons of Baltimore were merged into one institution which retains the double title.

MASSACHUSETTS

Boston University School of Medicine.....Boston
Medical School of Harvard University.....Boston
Tufts College Medical School.....Boston

MICHIGAN

Detroit College of Medicine and Surgery.....Detroit
University of Michigan Medical School.....Ann Arbor
University of Mich. Homeopathic Med. School....Ann Arbor

MINNESOTA

University of Minnesota Medical School.....Minneapolis

MISSISSIPPI

University of Mississippi Dept. of Medicine*.....Oxford

MISSOURI

St. Louis University School of Medicine.....St. Louis
University of Missouri School of Medicine*.....Columbia
Washington University Medical School.....St. Louis

NEBRASKA

University of Nebraska College of Medicine.....Omaha

NEW HAMPSHIRE

Dartmouth Medical School*.....Hanover

NEW YORK

Albany Medical College.....Albany
Columbia Univ. Coll. of Phys. and Surgs....New York City
Cornell University Medical College.....New York City
Fordham University School of Medicine....New York City
Long Island College Hospital.....Brooklyn
Syracuse University College of Medicine.....Syracuse
University and Bellevue Hospital Med. Coll..New York City
University of Buffalo Department of Medicine.....Buffalo

NORTH CAROLINA

University of North Carolina School of Med.* Chapel Hill
Wake Forest College School of Medicine*....Wake Forest

NORTH DAKOTA

University of North Dakota School of Medicine*..University

OHIO

Ohio State University College of Medicine.....Columbus
University of Cincinnati College of Medicine.....Cincinnati
Western Reserve University School of Medicine..Cleveland

OREGON

University of Oregon Department of Medicine.....Portland

PENNSYLVANIA

Hahnemann Medical College and Hospital.....Philadelphia
Jefferson Medical College of Philadelphia.....Philadelphia
University of Pennsylvania School of Med....Philadelphia
University of Pittsburgh School of Medicine....Pittsburgh
Woman's Medical College of Pennsylvania.....Philadelphia

SOUTH CAROLINA

Medical College of the State of South Carolina[6]..Charleston

* These colleges give only the first two years of the medical course.
6. Rating changed from Class B to Class A, Feb. 6, 1916.

SOUTH DAKOTA

University of South Dakota College of Medicine*..Vermilion

TENNESSEE

Vanderbilt University Medical Department.....Nashville
University of Tennessee College of Medicine.....Memphis

TEXAS

Baylor University College of Medicine[7].....Dallas
University of Texas Department of Medicine.....Galveston

UTAH

University of Utah School of Medicine*.....Salt Lake City

VERMONT

University of Vermont College of Medicine.....Burlington

VIRGINIA

Medical College of Virginia.....Richmond
University of Virginia Department of Med....Charlottesville

WISCONSIN

Marquette University School of Medicine.....Milwaukee
University of Wisconsin Medical School*.....Madison

Total, 67.

## CLASS B—COLLEGES NEEDING GENERAL IMPROVEMENTS TO BE MADE ACCEPTABLE

ARKANSAS

University of Arkansas Medical Department.....Little Rock

CALIFORNIA

College of Physicians and Surgeons.....Los Angeles
Oakland College of Medicine and Surgery.....Oakland

ILLINOIS

Loyola University Medical Department†.....Chicago
Chicago College of Medicine and Surgery.....Chicago
Hahnemann Medical College and Hospital.....Chicago

NEBRASKA

John A. Creighton Medical College.....Omaha

NEW YORK

New York Homeopathic Medical College and Flower Hospital .....New York City

NORTH CAROLINA

Leonard Medical School*.....Raleigh

OHIO

Eclectic Medical College.....Cincinnati

OKLAHOMA

Univ. of Oklahoma School of Med..Norman-Oklahoma City

PENNSYLVANIA

Temple University Department of Medicine.....Philadelphia

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7. Rating raised to Class A, June 12, 1916.
† Heretofore known as the Bennett Medical College.

TENNESSEE

Meharry Medical College.....Nashville

TEXAS

Fort Worth School of Medicine.....Fort Worth

WEST VIRGINIA

West Virginia University School of Med.*....Morgantown

Total, 15.

## CLASS C—COLLEGES REQUIRING A COMPLETE REORGANIZATION TO MAKE THEM ACCEPTABLE

CALIFORNIA

College of Medical Evangelists....Loma Linda-Los Angeles
College of Physicians and Surgeons.....San Francisco

ILLINOIS

Chicago Hospital College of Medicine.....Chicago
Jenner Medical College.....Chicago

MASSACHUSETTS

College of Physicians and Surgeons[8].....Boston

MISSOURI

Eclectic Medical University[9].....Kansas City
Southwest School of Medicine and Hospital[9]....Kansas City
National Univ. of Arts and Sciences Med. Dept.[10]..St. Louis

NEBRASKA

Lincoln Medical College[11].....Lincoln

NEW YORK

New York Med. Coll. and Hosp. for Women..New York City

OHIO

Ohio State Univ. Coll. of Homeopathic Med.....Columbus

TENNESSEE

University of West Tenn. Coll. of Med. and Surg..Memphis

Total 12.

## CLASSIFICATION OF CANADIAN MEDICAL COLLEGES

CLASS A

University of Toronto Faculty of Medicine....Toronto, Ont.
McGill University Faculty of Medicine.....Montreal, Que.

CLASS B

Dalhousie University Faculty of Medicine.....Halifax, N. S.
Montreal School of Medicine and Surgery....Montreal, Que.
Laval University Faculty of Medicine.....Quebec, Que.
University of Manitoba, Manitoba Medical College .....Winnipeg, Ont.

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8. Reported not recognized by the Massachusetts Medical Society.
9. Reported not recognized by the Missouri State Board of Health.
10. Formerly known as the American Medical College.
11. Formerly known as the Cotner University Medical College.

### Class C

Queen's University Faculty of Medicine.....Kingston, Ont.
Western University Faculty of Medicine.....London, Ont.

The University of Alberta at Edmonton, besides the premedical year, gives only the first two years of the medical course as measured by that of the medical schools of the United States. It has not been inspected.

### State Requirements of Higher Preliminary Education

There are now thirty-three states which have adopted requirements of preliminary education in addition to a standard four-year high school education. These states, the number of college years required and the time the higher requirements became effective are as follows:

| State Examining Board of | Number of Years Required | Affects Students Matriculating | Affects All Graduates |
|---|---|---|---|
| *Requiring Two Years:* | | | |
| Alabama | 2 | 1915-16 | 1919 |
| Arizona | 2 | 1918-19 | 1922 |
| Colorado | 2 | 1910-11 | 1914 |
| Indiana | 2 | 1911-12 | 1915 |
| Iowa | 2 | 1911-12 | 1915 |
| Maryland | 2 | 1918-19 | 1922 |
| Minnesota | 2 | 1908-09 | 1912 |
| New Hampshire | 2 | 1915-16 | 1919 |
| New Jersey | 2 | 1917-18 | 1921 |
| New Mexico | 2 | 1918-19 | 1922 |
| North Dakota | 2 | 1908-09 | 1912 |
| Oklahoma | 2 | 1917-18 | 1921 |
| Rhode Island | 2 | 1918-19 | 1922 |
| South Dakota | 2 | 1911-12 | 1915 |
| Virginia | 2 | 1917-18 | 1921 |
| Washington | 2 | 1918-19 | 1922 |
| Wisconsin | 2 | 1915-16 | 1919 |
| *Requiring One Year:* | | | |
| Arizona* | 1 | 1914-15 | 1918 |
| Arkansas | 1 | 1915-16 | 1919 |
| California | 1 | 1915-16 | 1919 |
| Connecticut | 1 | 1910-11 | 1914 |
| Illinois | 1 | 1915-16 | 1919 |
| Indiana* | 1 | 1910-11 | 1914 |
| Kansas | 1 | 1910-11 | 1914 |
| Kentucky | 1 | 1914-15 | 1918 |
| Louisiana | 1 | 1915-16 | 1919 |
| Maryland* | 1 | 1914-15 | 1918 |
| Michigan | 1 | 1914-15 | 1918 |
| Mississippi | 1 | 1915-16 | 1919 |
| New Hampshire* | 1 | 1914-15 | 1918 |
| New Jersey* | 1 | 1916-17 | 1920 |
| North Carolina | 1 | 1914-15 | 1918 |
| Oklahoma* | 1 | 1914-15 | 1918 |
| Pennsylvania | 1 | 1914-15 | 1918 |
| Rhode Island* | 1 | 1914-15 | 1918 |
| Tennessee | 1 | 1915-16 | 1919 |
| Texas | 1 | 1914-15 | 1918 |
| Utah | 1 | 1913-14 | 1917 |
| Vermont | 1 | 1913-14 | 1917 |
| Virginia* | 1 | 1914-15 | 1918 |
| Washington* | 1 | 1914-15 | 1918 |
| West Virginia | 1 | 1917-18 | 1921 |

* The 2-year requirement becomes effective later.

### Colleges Not Recognized

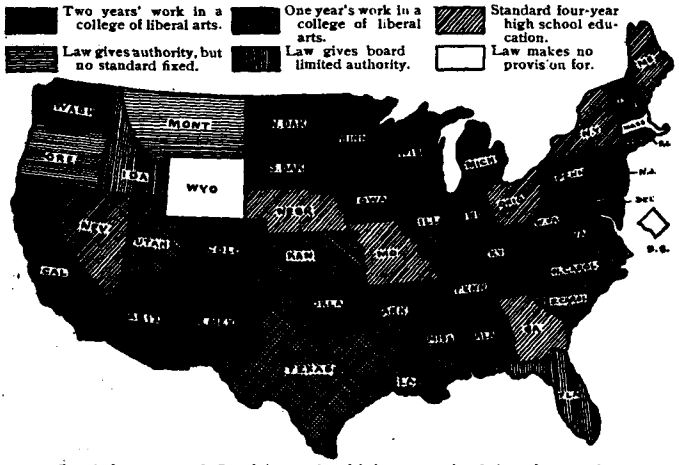
The licensing boards of New Hampshire, Rhode Island and Virginia report that they recognize only the medical colleges listed in Class A.

Official statement from the following thirty-four state licensing boards indicate that as a rule the colleges rated in Class C are not recognized:

| | | |
|---|---|---|
| Alabama | Maryland (Reg.) | Oklahoma |
| Arkansas (Reg.) | Michigan | Pennsylvania |
| Colorado | Minnesota | Porto Rico |
| Connecticut (Reg.) | Mississippi | Rhode Island |
| Delaware | New Hampshire | South Carolina |
| Florida (Reg.) | New Jersey | South Dakota |
| Georgia | New Mexico | Texas |
| Indiana | New York | Vermont |
| Iowa | North Carolina | Virginia |
| Kentucky | North Dakota | West Virginia |
| Louisiana (Reg.) | Ohio | Wisconsin |
| Maine | | |

Table 2, in the back of this pamphlet shows in what states diplomas from various medical colleges are not fully recognized.

## STATE REQUIREMENTS OF PRELIMINARY EDUCATION FOR PHYSICIANS




In Arkansas and Louisiana the higher standard has been adopted by the regular board only.

### Colleges Having Higher Entrance Requirements

The forty-six medical schools* which are now requiring, as a minimum for entrance *two years* or more of work in a college of liberal arts in addition to a four-year high-school education, the year when the higher requirement

* Colleges will be omitted from this list unless evidence obtained shows that, in the admission of students, they are requiring at least sixty semester hours of preliminary collegiate work in addition to a four-year high school education.

became effective and the rating of each college, are as follows:

| | In Effect | College Rating |
|---|---|---|
| **ALABAMA** | | |
| University of Alabama School of Medicine | 1915 | A |
| **CALIFORNIA** | | |
| College of Medical Evangelists | 1915 | C |
| College of Physicians and Surgeons, Los Angeles | 1916 | B |
| Leland Stanford Junior University School of Medicine | 1909 | A |
| University of California Medical School | 1905 | A |
| **COLORADO** | | |
| University of Colorado School of Medicine | 1910 | A |
| **CONNECTICUT** | | |
| Yale University School of Medicine | 1909 | A |
| **DISTRICT OF COLUMBIA** | | |
| Georgetown University School of Medicine | 1912 | A |
| Howard University School of Medicine | 1914 | A |
| **ILLINOIS** | | |
| Northwestern University Medical School | 1911 | A |
| Rush Medical College (University of Chicago) | 1904 | A |
| University of Illinois College of Medicine | 1914 | A |
| **INDIANA** | | |
| Indiana University School of Medicine | 1910 | A |
| **IOWA** | | |
| State University of Iowa College of Medicine | 1910 | A |
| State University of Iowa College of Homeopathic Medicine | 1910 | A |
| **KANSAS** | | |
| University of Kansas School of Medicine | 1909 | A |
| **MAINE** | | |
| Bowdoin Medical School | 1916 | A |
| **MARYLAND** | | |
| Johns Hopkins University Medical Department | 1893 | A |
| **MASSACHUSETTS** | | |
| Boston University School of Medicine | 1916 | A |
| Medical School of Harvard University | 1900 | A |
| **MICHIGAN** | | |
| University of Michigan Medical School | 1909 | A |
| University of Michigan Homeopathic Medical School | 1916 | A |
| **MINNESOTA** | | |
| University of Minnesota Medical School | 1907 | A |
| **MISSOURI** | | |
| University of Missouri School of Medicine | 1910 | A |
| Washington University Medical School | 1912 | A |
| **NEBRASKA** | | |
| University of Nebraska College of Medicine | 1909 | A |
| **NEW HAMPSHIRE** | | |
| Dartmouth Medical School | 1910 | A |
| **NEW YORK** | | |
| Columbia University College of Physicians and Surgeons | 1910 | A |
| Cornell University Medical College | 1908 | A |
| Syracuse University College of Medicine | 1910 | A |
| **NORTH CAROLINA** | | |
| Leonard Medical School | 1914 | B |
| Wake Forest College School of Medicine | 1908 | A |
| **NORTH DAKOTA** | | |
| University of North Dakota School of Medicine | 1907 | A |

| OHIO | In Effect | College Rating |
|---|---|---|
| Ohio State University College of Medicine | 1915 | A |
| Ohio State Univ. College of Homeopathic Medicine | 1916 | C |
| University of Cincinnati College of Medicine | 1913 | A |
| Western Reserve University School of Medicine | 1901 | A |
| **PENNSYLVANIA** | | |
| University of Pennsylvania School of Medicine | 1910 | A |
| University of Pittsburgh School of Medicine | 1913 | A |
| Woman's Medical College of Pennsylvania | 1915 | A |
| **SOUTH CAROLINA** | | |
| Medical College of the State of South Carolina | 1916 | A |
| **SOUTH DAKOTA** | | |
| University of South Dakota College of Medicine | 1909 | A |
| **UTAH** | | |
| University of Utah School of Medicine | 1910 | A |
| **VIRGINIA** | | |
| Medical College of Virginia | 1915 | A |
| **WISCONSIN** | | |
| Marquette University School of Medicine | 1915 | A |
| University of Wisconsin Medical School | 1907 | A |

The thirty-eight medical colleges† which are now requiring, as a minimum for entrance one year of collegiate work in addition to a four-year high school course, the years when the requirements began and the rating of the colleges are:

| | | |
|---|---|---|
| **ARKANSAS** | | |
| University of Arkansas Medical Department | 1915 | B |
| **CALIFORNIA** | | |
| Oakland College of Medicine and Surgery | 1915 | B |
| **DISTRICT OF COLUMBIA** | | |
| George Washington University Medical School | 1914 | A |
| **GEORGIA** | | |
| Atlanta Medical College | 1914 | A |
| University of Georgia Medical Department | 1914 | A |
| **ILLINOIS** | | |
| Loyola University Medical Department | 1915 | B |
| Chicago College of Medicine and Surgery | 1915 | B |
| Hahnemann Medical College and Hospital of Chicago | 1914 | B |
| **KENTUCKY** | | |
| University of Louisville Medical Department | 1914 | A |
| **LOUISIANA** | | |
| Tulane University of Louisiana School of Medicine | 1910 | A |
| **MARYLAND** | | |
| University of Maryland School of Medicine and College of Physicians and Surgeons | 1914 | A |
| **MASSACHUSETTS** | | |
| Tufts College Medical School | 1914 | A |
| **MICHIGAN** | | |
| Detroit College of Medicine and Surgery | 1914 | A |
| **MISSISSIPPI** | | |
| University of Mississippi Department of Medicine | 1914 | A |

† Colleges will be omitted from this list unless evidence obtained shows that, in the admission of students, they are requiring at least thirty semester hours of preliminary collegiate work, in addition to a four-year high school education.

| | In Effect | College Rating |
|---|---|---|
| **MISSOURI** | | |
| St. Louis University School of Medicine | 1910 | A |
| **NEBRASKA** | | |
| John A. Creighton Medical College | 1914 | B |
| **NEW YORK** | | |
| Albany Medical College | 1914 | A |
| Fordham University School of Medicine | 1911 | A |
| Long Island College Hospital | 1914 | A |
| New York Homeopathic Medical College and Flower Hospital | 1915 | B |
| New York Medical College and Hospital for Women | 1916 | C |
| University and Bellevue Hospital Medical College | 1912 | A |
| University of Buffalo Department of Medicine | 1914 | A |
| **NORTH CAROLINA** | | |
| University of North Carolina School of Medicine | 1910 | A |
| **OHIO** | | |
| Eclectic Medical College | 1915 | B |
| **OKLAHOMA** | | |
| University of Oklahoma School of Medicine | 1914 | B |
| **OREGON** | | |
| University of Oregon Department of Medicine | 1910 | A |
| **PENNSYLVANIA** | | |
| Hahnemann Medical College and Hospital of Philadelphia | 1914 | A |
| Jefferson Medical College of Philadelphia | 1914 | A |
| Temple University Department of Medicine | 1914 | B |
| **TENNESSEE** | | |
| Vanderbilt University Medical Department | 1914 | A |
| University of Tennessee College of Medicine | 1914 | A |
| **TEXAS** | | |
| University of Texas Department of Medicine | 1910 | A |
| Baylor University College of Medicine | 1913 | A |
| Fort Worth School of Medicine | 1916 | B |
| **VERMONT** | | |
| University of Vermont College of Medicine | 1912 | A |
| **VIRGINIA** | | |
| University of Virginia Department of Medicine | 1910 | A |
| **WEST VIRGINIA** | | |
| West Virginia University School of Medicine | 1911 | A |

The fifteen following medical colleges, now requiring one year of collegiate work for admission, have announced that all students admitted in and after the session given will be required to have completed *two years* of collegiate work:

| | Session of |
|---|---|
| University of North Carolina School of Medicine | 1917-18 |
| University of Oklahoma School of Medicine | 1917-18 |
| Hahnemann Medical College of Philadelphia | 1917-18 |
| Jefferson Medical College | 1917-18 |
| University of Texas Department of Medicine | 1917-18 |
| University of Virginia Department of Medicine | 1917-18 |
| West Virginia University School of Medicine | 1917-18 |
| Atlanta Medical College | 1918-19 |
| University of Georgia Medical Department | 1918-19 |
| Tulane University School of Medicine | 1918-19 |
| University of Maryland School of Medicine and College of Physicians and Surgeons | 1918-19 |
| University of Mississippi Department of Medicine | 1918-19 |
| St. Louis University School of Medicine | 1918-19 |
| Long Island College Hospital | 1918-19 |
| University and Bellevue Hospital Medical College | 1918-19 |

The ten following medical colleges either have not announced the higher entrance requirements or evidence has not been received to show they are in effect for all students enrolled:

| | Rating |
|---|---|
| College of Physicians and Surgeons, San Francisco | C |
| Chicago Hospital College of Medicine | C |
| Jenner Medical College, Chicago | C |
| College of Physicians and Surgeons, Boston | C |
| Eclectic Medical University, Kansas City | C |
| Kansas City College of Medicine and Surgery | * |
| National University of Arts and Sciences, St. Louis | C |
| Southwest School of Medicine and Hospital, Kansas City | C |
| Lincoln Medical College, Lincoln, Neb | C |
| University of West Tenn. College of Med. and Surg., Memphis | C |

* This college has not been inspected.

## State University Medical Schools

Twenty-nine states now have medical schools as integral parts of the state universities or—in one instance—under state control as a separate institution. These states and other interesting data regarding the medical schools are as follows:

STATE UNIVERSITY MEDICAL SCHOOLS

| Medical School of State University of | Only School in State | Length of Med. Course in Years | Years of College Work for Admission | Medical School of State University of | Only School in State | Length of Med. Course in Years | Years of College Work for Admission |
|---|---|---|---|---|---|---|---|
| Alabama | Yes | 4 | 2† | North Carolina | .... | 2 | 2 |
| Arkansas | Yes | 4 | 1 | North Dakota | Yes | 2 | 2† |
| California | .... | 5 | 2 | Ohio* | .... | 4 | 2 |
| Colorado | Yes | 4 | 2† | Oklahoma | Yes | 4 | 2† |
| Georgia | .... | 4 | 2 | Oregon | Yes | 4 | 1 |
| Illinois | .... | 4 | 2 | South Carolina | Yes | 4 | 2 |
| Indiana | Yes | 4 | 2† | South Dakota | Yes | 2 | 2† |
| Iowa* | Yes | 4 | 2† | Tennessee | .... | 4 | 1 |
| Kansas | Yes | 4 | 2 | Texas | .... | 4 | 2 |
| Maryland | .... | 4 | 2† | Utah | Yes | 2 | 2 |
| Michigan* | .... | 4 | 2 | Vermont | Yes | 5 | 1 |
| Minnesota | Yes | 5 | 2† | Virginia | .... | 4 | 2† |
| Mississippi | Yes | 2 | 2 | West Virginia | Yes | 2 | 2 |
| Missouri | .... | 2 | 2 | Wisconsin | .... | 2 | 2† |
| Nebraska | .... | 4 | 2 | | | | |

* Have homeopathic departments.
† Similar requirements by licensing board.

In sixteen states no other medical schools exist, medical education in the state being entirely in charge of the state university.

An act of the Maryland legislature in 1914 created a Maryland State University and provided $15,000 per year for 1915 and 1916, to be used for medical education in the state. A feature in its development was the merger in 1915 between the University of Maryland School of Medicine and the College of Physicians and Surgeons of Baltimore.

Of the twenty-nine state medical schools, twenty-one give the complete medical course and grant degrees while eight give only the first two years of the medical course. California, Minnesota and Vermont require a five-year course, the fifth year to be spent by the student in a hospital as an intern, or in other recognized clinical work. The universities of Iowa, Michigan and Ohio have homeopathic departments.

All but four of these medical schools require or have announced the requirement of two years of college work for admission, the exceptions being those of Arkansas, Oregon, Tennessee and Vermont. Of the twenty-five which have adopted the higher entrance standard eleven have the support of their state licensing boards which have adopted two years of college work as the minimum requirement of preliminary education. In some of the remaining states the licensing boards do not appear to be in sympathy with the higher requirement.

### Hospital Intern Year

Six medical colleges have adopted the requirement of a fifth year to be spent by the student as an intern in an approved hospital or in other acceptable clinical work before the M.D. degree will be granted. These colleges and the sessions when the requirement became effective are as follows:

| | Session of |
|---|---|
| University of Minnesota Medical School | 1910-11 |
| Leland Stanford Jr. University School of Medicine | 1914-15 |
| Rush Medical College (University of Chicago) | 1914-15 |
| University of California Medical School | 1914-15 |
| Northwestern University Medical School | 1915-16 |
| University of Vermont College of Medicine | 1915-16 |

Four state licensing boards now require that every candidate to be eligible for license to practice medicine in those states must have served at least one year as an intern in an approved hospital. The requirement became effective in Pennsylvania in 1914, in New Jersey in 1916, and will become effective in Rhode Island in 1917 and in North Dakota in 1918.

## TABLE 2.—NONRECOGNITION OF MEDICAL COLLEGES

*This Table, Based on Official Reports, Shows the Numerous Pitfalls to be Avoided by Prospective Medical Students*

The meaning of the letters (a, b, c, d, x) is given in the footnotes.

| Marginal Number | COLLEGE | Classification by Council on Medical Education† | 1 Alabama | 2 Alaska | 3 Arizona | 4 Arkansas | 5 California | 6 Colorado | 7 Connecticut | 8 Delaware | 9 Dist. of Columbia | 10 Florida | 11 Georgia | 12 Idaho | 13 Illinois | 14 Indiana | 15 Iowa | 16 Kansas | 17 Kentucky | 18 Louisiana | 19 Maine | 20 Maryland | 21 Massachusetts | 22 Michigan | 23 Minnesota | 24 Mississippi | 25 Missouri | 26 Montana | 27 Nebraska | 28 Nevada | 29 New Hampshire | 30 New Jersey | 31 New Mexico | 32 New York | 33 North Carolina | 34 North Dakota | 35 Ohio | 36 Oklahoma | 37 Oregon | 38 Pennsylvania | 39 Rhode Island | 40 South Carolina | 41 South Dakota | 42 Tennessee | 43 Texas | 44 Utah | 45 Vermont | 46 Virginia | 47 Washington | 48 West Virginia | 49 Wisconsin | 50 Wyoming | 51 Porto Rico | No. of State Boards reporting full recognition | No. of State Boards reporting college not fully recognized | Percentage of State Boards granting full recognition | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | University of Alabama, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2 | University of Arkansas, Medical Department | B | b | | | | | a | | x | | | | | | b | b | | | | | | | | | b | | | | | x | b | | | | b | x | b | | x | x | | e | | | | | x | | | b | | | 35 | 16 | 69 | 2 |
| 3 | College of Physicians and Surgeons, San Francisco | C | x | | | x | | x | x | x | | x | x | | x | b | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 17 | 34 | 33 | 3 |
| 4 | Leland Stanford Junior Univ., School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| 5 | University of California Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 6 | College of Physicians and Surgeons, Los Angeles | B | | | | | | | | x | | | | | | | | | | | | | | | x | | | | | | x | | | | | | x | | | | x | | | | | | | | x | | | | | | 45 | 6 | 88 | 6 |
| 7 | Oakland College of Medicine and Surgery | B | b | | | | | a | | x | | | | | | b | b | | | | | | | | x | b | | | | | x | x | | x | | b | x | b | | | x | | e | | | | | x | | | b | | | 34 | 17 | 67 | 7 |
| 8 | College of Medical Evangelists | C | x | | | x | | x | x | x | | x | x | | x | | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 18 | 33 | 35 | 8 |
| 9 | University of Colorado, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 9 |
| 10 | Yale University, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 |
| 11 | George Washington University, Medical School | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 11 |
| 12 | Georgetown University, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12 |
| 13 | Howard University, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 13 |
| 14 | Atlanta Medical College | B | b | | | | | a | | | | | | | | b | b | | x | | | | | | | b | | | | | b | b | | | | b | | b | | x | | | e | | | | | b | | | b | | | 37 | 14 | 73 | 14 |
| 15 | Georgia College of Eclectic Medicine and Surgery | C | x | | | | | x | | x | | | x | | x | b | x | | x | x | x | x | | | x | x | x | | | | x | x | | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 21 | 30 | 41 | 15 |
| 16 | University of Georgia, Medical Department | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 16 |
| 17 | Bennett Medical College | B | b | | | | | x | | x | | | | | | b | b | | x | | | | | | x | b | | | | | x | x | | x | | b | x | b | | x | x | | e | | | | | x | | | x | | | 32 | 19 | 63 | 17 |
| 18 | Chicago College of Medicine and Surgery | B | b | | | | | a | | x | | | | | | b | b | | x | | | | | | x | b | | | | | x | x | | x | | b | x | b | | x | x | | e | | | | | x | | | x | | | 32 | 19 | 63 | 18 |
| 19 | Chicago Hospital College of Medicine | C | x | | | x | | x | x | x | | x | x | | x | x | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 18 | 33 | 35 | 19 |
| 20 | Hahnemann Medical College and Hospital, Chicago | B | b | | | | | a | | x | | | | | | b | b | | | | | | | | | b | | | | | x | x | | x | | b | | b | | | x | | e | | | | | x | | | b | | | 36 | 15 | 71 | 20 |
| 21 | Janner Medical College, Chicago | C | x | | | x | | x | x | x | | x | x | | | x | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 18 | 33 | 35 | 21 |
| 22 | Northwestern University Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 22 |
| 23 | Rush Medical College (University of Chicago) | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 23 |
| 24 | University of Illinois, College of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 24 |
| 25 | Indiana University, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 |
| 26 | State University of Iowa, College of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 26 |
| 27 | State University of Iowa, College of Homeo. Med. | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 27 |
| 28 | University of Kansas, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | | | | | | | | | | | | | | | | 50 | 1 | 98 | 28 |
| 29 | University of Louisville, Medical Department | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 29 |
| 30 | Tulane University School of Medicine | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 30 |
| 31 | Bowdoin Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 |
| 32 | Johns Hopkins University, Medical Department | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 32 |
| 33 | Univ. of Md., School of Med. and Coll. of P. & S. | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 36 | 15 | 71 | 33 |
| 34 | Boston University, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 34 |
| 35 | College of Physicians and Surgeons, Boston | C | x | | | x | | x | x | x | | x | x | | x | x | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 17 | 34 | 33 | 35 |
| 36 | Medical School of Harvard University | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 36 |
| 37 | Tufts College Medical School | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | x | | | e | | | | | b | | | b | | | 38 | 13 | 75 | 37 |
| 38 | Detroit College of Medicine and Surgery | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 38 |
| 39 | University of Michigan Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 39 |
| 40 | University of Michigan, Homeopathic Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 40 |
| 41 | University of Minnesota Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 41 |
| 42 | University of Mississippi, Department of Medicine* | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 42 |
| 43 | University of Missouri, School of Medicine* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 43 |
| 44 | Southwest School of Medicine and Hospital | C | x | | | | | x | | x | | | x | | x | b | x | | x | x | x | | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 20 | 31 | 39 | 44 |
| 45 | Eclectic Medical University, Kansas City | C | x | | | | | x | | x | | | x | | x | x | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 19 | 32 | 37 | 45 |
| 46 | National University of Arts and Sciences, Med. Dept. | C | x | | | x | | x | x | x | | x | x | | x | b | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 17 | 34 | 33 | 46 |
| 47 | St. Louis University, School of Medicine | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 47 |
| 48 | Washington University Medical School | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 48 |
| 49 | John A. Creighton Medical College | B | b | | | | | a | | x | | | | | | b | b | | | | | | | | | b | | | | | x | b | | | | b | x | b | | | x | | e | | | | | x | | | b | | | 38 | 13 | 75 | 49 |
| 50 | University of Nebraska, College of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 50 |
| 51 | Lincoln Medical College, Eclectic, Lincoln, Neb. | C | x | | | | | x | | x | | | x | | x | b | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | | x | | x | x | | e | | | | | x | x | | x | x | | x | 21 | 30 | 41 | 51 |
| 52 | Dartmouth Medical School* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 52 |
| 53 | Albany Medical College | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | x | | | e | | | | | b | | | b | | | 38 | 13 | 75 | 53 |
| 54 | Columbia University, College of Phys. and Surgs. | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 54 |
| 55 | Cornell University Medical College | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 55 |
| 56 | Fordham University, School of Medicine | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 56 |
| 57 | Long Island College Hospital | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 57 |
| 58 | New York Homeopathic Med. Coll. and Flower Hosp. | B | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | x | b | | | | b | | b | | | x | | e | | | | | x | | | b | | | 38 | 13 | 75 | 58 |
| 59 | New York Medical College and Hospital for Women | C | x | | | | | x | | x | | | x | | x | b | x | | x | x | x | x | | | x | x | x | | | | x | b | x | | x | x | | x | | x | x | | e | | | | | x | x | | x | x | | x | 23 | 30 | 45 | 59 |
| 60 | University and Bellevue Hospital Medical College | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 60 |
| 61 | Syracuse University, College of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 61 |
| 62 | University of Buffalo, Medical Department | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | x | | | e | | | | | b | | | b | | | 38 | 13 | 75 | 62 |
| 63 | Leonard Medical School* | B | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | x | x | | x | | | x | | | x | x | | | | | | | x | | | | | | 43 | 8 | 84 | 63 |
| 64 | University of North Carolina, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 64 |
| 65 | Wake Forest College School of Medicine* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 65 |
| 66 | University of North Dakota, School of Medicine* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 66 |
| 67 | Western Reserve University, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 67 |
| 68 | Eclectic Medical College | B | b | | | | | a | | x | | | | | | b | b | | | | | | | | | b | | | | a | x | b | | | | b | | b | | | x | | c | | | | | x | | | b | | | 37 | 14 | 73 | 68 |
| 69 | Medical College of the University of Cincinnati | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 69 |
| 70 | Ohio State University, College of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 70 |
| 71 | Ohio State University, College of Homeopathic Med. | C | x | | | | | | | x | | | x | | d | | | | | x | x | | | | | x | x | | | | | x | x | | x | x | | | | | x | | | | | | | x | x | | | | | x | 35 | 16 | 69 | 71 |
| 72 | University of Oklahoma, School of Medicine | B | b | | | | | | | x | | | | | | | | | | | | | | | | | | | | | x | | | | | | x | | | x | x | | | | | | | | x | | | | | | 45 | 6 | 88 | 72 |
| 73 | University of Oregon, Medical Department | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 73 |
| 74 | Hahnemann Medical Coll. and Hosp., Philadelphia | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 74 |
| 75 | Jefferson Medical College | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 75 |
| 76 | Medico-Chirurgical College of Philadelphia | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 76 |
| 77 | Temple University, Medical Department | B | b | | | | | a | | x | | | | | d | b | b | | x | | | | | | x | b | | | | | x | x | | x | | b | x | b | | | x | | e | | | | | x | | | b | | | 32 | 19 | 63 | 77 |
| 78 | University of Pennsylvania, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 78 |
| 79 | Woman's Medical College of Pennsylvania | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 79 |
| 80 | University of Pittsburgh, School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 80 |
| 81 | Medical College of the State of South Carolina | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | | x | | | x | | | x | | | | | | | | | | | | | | 47 | 4 | 92 | 81 |
| 82 | University of South Dakota, College of Medicine* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 82 |
| 83 | Meharry Medical College | B | b | | | | | a | | x | | | | | | b | b | | x | | | | | | x | b | | | | | x | x | | x | | b | | b | | x | x | | e | | | | | x | | | b | | | 38 | 16 | 65 | 83 |
| 84 | Vanderbilt University, Medical Department | A | b | | | | | a | | | | | | | | b | b | | x | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 38 | 13 | 76 | 84 |
| 85 | University of Tennessee, College of Medicine | A | b | | | | | a | | | | | | | | b | b | | x | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 38 | 13 | 76 | 85 |
| 86 | University of West Tennessee, Medical Department | C | x | | | x | | x | x | x | | x | x | | x | x | x | | x | x | x | x | | | x | x | x | | | | x | x | x | x | x | x | x | x | | x | x | | e | | | | | x | x | | x | x | | x | 16 | 35 | 51 | 86 |
| 87 | University of Texas, Department of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 87 |
| 88 | Baylor University, College of Medicine | A | b | | | | | a | | x | | | | | | b | b | | | | | | | | | b | | | | | x | b | | | | b | x | b | | x | | | e | | | | | x | | | b | | | 36 | 15 | 71 | 88 |
| 89 | Fort Worth School of Medicine | B | b | | | | | a | | x | | | | | d | b | b | | x | | | | | | x | b | | | | | | b | | x | | b | x | b | | x | x | | e | | | | | b | | | b | | | 31 | 20 | 61 | 89 |
| 90 | University of Utah, School of Medicine* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 90 |
| 91 | University of Vermont, College of Medicine | A | b | | | | | a | | | | | | | | b | b | | | | | | | | | b | | | | | b | b | | | | b | | b | | | | | e | | | | | b | | | b | | | 39 | 12 | 77 | 91 |
| 92 | Medical College of Virginia | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 92 |
| 93 | University of Virginia, Department of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 93 |
| 94 | West Virginia University, School of Medicine* | B | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | x | x | | x | | | x | | | | x | | | | | | | | x | | | | | | 44 | 7 | 86 | 94 |
| 95 | Marquette University School of Medicine | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | | | x | x | | | | | | | | | | | | | 48 | 3 | 94 | 95 |
| 96 | University of Wisconsin Medical School* | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 96 |
| | Number of Medical Colleges of which at least some graduates are evidently ineligible for license | | 47 | | | 7 | | 46 | 7 | 28 | | 7 | 18 | | 18 | 46 | 46 | | 20 | 18 | 18 | 10 | | 20 | 47 | 12 | 3 | | | 51 | 50 | 11 | 22 | 18 | 46 | 24 | 46 | | 20 | 20 | 12 | 47 | | | | 18 | 51 | | 12 | 46 | | 18 | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | | | | |

* Eleven medical colleges give only the first two years of the medical course. Work taken in seven of these is apparently fully accepted by all boards for advanced standing in other recognized medical colleges. Work taken in one other is reported not so recognized in twelve states unless the student entered with two years of preliminary college work.

† Classification revised to Aug. 1, 1916.

(a) Colorado registers without further examination only graduates of medical colleges in good standing who present licenses issued after examination granted by other state licensing boards. The law permits any one, graduate or nongraduate, to try the Board's written examination. No graduate, hereafter, is eligible to license on indorsement of credentials unless he completed two years of collegiate work prior to beginning the study of medicine.

(b) Alabama, Indiana, Iowa, Minnesota, New Hampshire, New Jersey, North Dakota, Oklahoma, Virginia and Wisconsin report that no graduate of any medical school may take examinations in those states unless before entering on the study of medicine he or she has completed two years of work in an approved college or university. In Indiana the rule applies to all candidates who matriculated in medical college after Jan. 1, 1911. This rule applies to all graduates hereafter in Iowa, Minnesota and North Dakota. This rule is reported to apply to all graduates of 1919 and thereafter in Alabama, New Hampshire and Wisconsin. In New Jersey, Oklahoma and Virginia the rule will apply to all graduates of 1921 and thereafter.

(c) South Dakota reports that no medical college will be considered in good standing which accepts or graduates students who do not have the required preliminary education — two years of collegiate work. This has applied to all colleges since Aug. 1, 1911, and to graduates of 1915 and thereafter.

(d) College not fully recognized (March 1, 1916). Under investigation by the Illinois State Board of Health.

(x) According to official reports the licensing boards of the states thus indicated do not grant full recognition to, or have taken action refusing to admit to their examinations graduates of, the colleges marked by this letter—x.

## TABLE 1.—STATISTICS OF MEDICAL COLLEGES IN THE UNITED STATES AND CANADA

| Marginal Number | Name and Location of College | Population of City Where Located, Census Bureau Estimate of 1915 | Classification by Council on Medical Education | No. of Students Registered 1915-16: Men | No. of Students Registered 1915-16: Women | Graduates 1916: Men | Graduates 1916: Women | Grads. with A.B., or Ph.B. | Number of Teachers | Weeks in College Year | Total Fees (Dollars): 1st year | 2d year | 3d year | 4th year | Executive Officer | Session of 1916-17: Begins 1916 | Ends 1917 | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ALABAMA | | | | | | | | | | | | | | | | | |
| 1 | University of Alabama School of Medicine, Mobile | 56,536 | A | 56 | ... | 13 | ... | 6 | 42 | 32 | 160 | 155 | 155 | 175 | T. H. Fraser, M.D., Dean | Oct. 5 | June 5 | 1 |
| | ARKANSAS | | | | | | | | | | | | | | | | | |
| 2 | University of Arkansas Medical Department, Little Rock | 56,158 | B | 55 | 1 | 15 | 1 | 62 | 33 | 126 | 125 | 125 | 150 | Morgan Smith, M.D., Dean | Sept. 18 | May 31 | 2 |
| | CALIFORNIA | | | | | | | | | | | | | | | | | |
| 3 | College of Medical Evangelists, Loma Linda | 175 | O | 43 | 9 | 6 | 3 | ... | 55 | 35 | 141 | 186 | 186 | 146 | Newton Evans, M.D., Dean | Sept. 11 | May 31 | 3 |
| 4 | College of Physicians and Surgeons, Los Angeles | 465,267 | B | 121 | 11 | 21 | 2 | 5 | 96 | 36 | 225 | 217 | 202 | 227 | Charles W. Bryson, M.D., Dean | Sept. 5 | June 7 | 4 |
| 5 | Oakland College of Medicine and Surgery, Oakland | 190,803 | B | 10 | 3 | 2 | ... | 1 | 40 | 33 | 125 | 150 | 150 | 150 | Edward N. Ewer, M.D., Registrar | Aug. 21 | June 1 | 5 |
| 6 | College of Physicians and Surgeons of San Francisco | 448,502 | O | 57 | 6 | 8 | 1 | 1 | 23 | 36 | 165 | 160 | 160 | 185 | O. O. Southard, M.D., Secretary | Sept. 4 | June 7 | 6 |
| 7 | Hahnemann Medical College of the Pacific, San Francisco.—H.[1] | 448,502 | B | 85 | 8 | 10 | 3 | ... | 47 | 36 | ... | ... | 105 | 180 | James W. Ward, M.D., Dean | Aug. 16 | May 17 | 7 |
| 8 | Leland Stanford Junior University School of Med., San Francisco | 448,502 | A | 77 | 19 | 21 | 3 | 33 | 98 | 34 | 150 | 155 | 150 | 150 | Wm. Ophüls, M.D., Dean | Aug. 30 | May 26 | 8 |
| 9 | University of California Medical School, San Francisco | 448,502 | A | 105 | 19 | 24 | 5 | 23 | 104 | 36 | 160 | 175 | 180 | 160 | L. S. Schmitt, M.D., Secretary | Aug. 19 | May 16 | 9 |
| | COLORADO | | | | | | | | | | | | | | | | | |
| 10 | University of Colorado School of Medicine, Denver | 253,161 | A | 75 | 4 | 13 | ... | 6 | 86 | 35 | 85 | 85 | 75 | 75 | Charles N. Meader, M.D., Dean | Sept. 11 | June 6 | 10 |
| | CONNECTICUT | | | | | | | | | | | | | | | | | |
| 11 | Yale University School of Medicine, New Haven | 147,095 | A | 56 | ... | 6 | ... | 6 | 76 | 35 | 200 | 170 | 153 | 153 | George Blumer, M.D., Dean | Sept. 28 | June 20 | 11 |
| | DISTRICT OF COLUMBIA | | | | | | | | | | | | | | | | | |
| 12 | Georgetown University School of Medicine, Washington | 358,679 | A | 53 | ... | 7 | ... | 3 | 91 | 34 | 155 | 150 | 150 | 150 | George M. Kober, M.D., Dean | Sept. 24 | June 13 | 12 |
| 13 | George Washington University Medical School, Washington | 358,679 | A | 154 | 7 | 26 | 1 | 2 | 65 | 32 | 168 | 169 | 168 | 168 | W. C. Borden, M.D., Dean | Sept. 27 | June 6 | 13 |
| 14 | Howard University School of Medicine, Washington | 358,679 | A- | 99 | 1 | 15 | ... | 7 | 53 | 32 | 137 | 127 | 127 | 134 | Edward A. Balloch, M.D., Dean | Oct. 2 | June 6 | 14 |
| | GEORGIA | | | | | | | | | | | | | | | | | |
| 15 | Atlanta Medical College, Atlanta | 154,873 | A | 222 | ... | 101 | ... | 5 | 101 | 32 | 172 | 160 | 155 | 180 | W. S. Elkin, M.D., Dean | Sept. 25 | May 29 | 15 |
| 16 | Georgia College of Eclectic Medicine and Surgery, Atlanta.—E.[2] | 154,873 | O | 29 | ... | 29 | ... | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 16 |
| 17 | University of Georgia Medical Department, Augusta | 49,843 | A | 54 | ... | 10 | ... | 3 | 49 | 34 | 155 | 150 | 150 | 150 | William H. Doughty, Jr., M.D., Dean | Sept. 13 | May 30 | 17 |
| | ILLINOIS | | | 1875 | 115 | 462 | 28 | 118 | | | | | | | | | | |
| 18 | Chicago College of Medicine and Surgery, Chicago | 2,447,045 | B | 468 | 23 | 190 | 4 | 4 | 167 | 32 | 155 | 155 | 155 | 155 | G. E. Wyneken, M.D., Secretary | Sept. 26 | May 27 | 18 |
| 19 | Chicago Hospital College of Medicine, Chicago[3] | 2,447,045 | O | 60 | ... | 9 | ... | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 19 |
| 20 | Hahnemann Medical College and Hospital of Chicago.—H. | 2,447,045 | B | 77 | 8 | 16 | 2 | 1 | 73 | 33 | 171 | 161 | 176 | 191 | Joseph P. Cobb, M.D., Dean | Sept. 25 | June 7 | 20 |
| 21 | Jenner Medical College, Chicago[4] | 2,447,045 | O | 83 | 10 | 14 | 1 | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 21 |
| 22 | Loyola University School of Medicine, Chicago[5] | 2,447,045 | B | 294 | 14 | 126 | 6 | 4 | 86 | 34 | 140 | 140 | 140 | 140 | Alfred de Roulet, M.D., Secretary | Sept. 25 | June 13 | 22 |
| 23 | Northwestern University Medical School, Chicago | 2,447,045 | A | 226 | ... | 43 | ... | 19 | 124 | 32 | 190 | 195 | 190 | 205 | Arthur R. Edwards, M.D., Dean | Oct. 2 | June 2 | 23 |
| 24 | Rush Medical College (University of Chicago) | 2,447,045 | A | 450 | 33 | 92 | 5 | 54 | 201 | 34 | 185 | 180 | 180 | 195 | John M. Dodson, M.D., Dean | Oct. 2 | June 13 | 24 |
| 25 | University of Illinois College of Medicine, Chicago | 2,447,045 | A | 324 | 22 | 103 | 7 | 6 | 145 | 34 | 155 | 150 | 150 | 155 | William H. Browne, Secretary | Sept. 28 | June 13 | 25 |
| | INDIANA | | | 156 | ... | 24 | ... | 28 | | | | | | | | | | |
| 26 | Indiana University School of Medicine, Indianapolis | 265,578 | A | 156 | ... | 24 | ... | 28 | 126 | 34 | 100 | 100 | 100 | 130 | Charles P. Emerson, M.D., Dean | Sept. 19 | June 9 | 26 |
| | IOWA | | | 153 | 3 | 28 | ... | 10 | | | | | | | | | | |
| 27 | State University of Iowa College of Medicine, Iowa City | 10,387 | A | 149 | 2 | 29 | ... | 10 | 54 | 35 | 85 | 85 | 85 | 85 | Lee Wallace Dean, M.D., Dean | Sept. 18 | June 13 | 27 |
| 28 | State University of Iowa College of Homeo. Med., Iowa City.—H. | 10,387 | A | 9 | 1 | ... | ... | ... | 27 | 34 | 65 | 85 | 85 | 85 | George Royal, M.D., Dean | Sept. 18 | June 8 | 28 |
| | KANSAS | | | 98 | 6 | 10 | 1 | 9 | | | | | | | | | | |
| 29 | University of Kansas School of Medicine, Rosedale | 392,593 | A | 99 | 6 | 10 | 1 | 9 | 61 | 35 | 90 | 90 | 105 | 105 | M. T. Sudler, M.D., Asso. Dean | Sept. 13 | June 6 | 29 |
| | KENTUCKY | | | 148 | ... | 54 | ... | 5 | | | | | | | | | | |
| 30 | University of Louisville Medical Department, Louisville | 237,012 | A | 149 | ... | 54 | ... | 6 | 101 | 33 | 173 | 176 | 179 | 182 | Henry E. Tuley, M.D., Dean | Sept. 26 | June 7 | 30 |
| | LOUISIANA | | | 264 | 1 | 75 | ... | 8 | | | | | | | | | | |
| 31 | Tulane University of Louisiana School of Medicine, New Orleans | 366,454 | A | 264 | 1 | 75 | ... | 9 | 116 | 38 | 190 | 190 | 185 | 215 | Isadore Dyer, M.D., Dean | Sept. 27 | June 6 | 31 |
| | MAINE | | | 60 | ... | 10 | ... | 5 | | | | | | | | | | |
| 32 | Bowdoin Medical School, Brunswick-Portland | 63,011 | A | 60 | ... | 10 | ... | 6 | 61 | 33 | 115 | 115 | 115 | 115 | Addison S. Thayer, M.D., Dean | Oct. 18 | June 21 | 32 |
| | MARYLAND | | | 833 | 33 | 188 | 6 | 95 | | | | | | | | | | |
| 33 | Johns Hopkins University Medical Department, Baltimore | 584,605 | A | 515 | 33 | 75 | 6 | 82 | 156 | 33 | 240 | 200 | 200 | 200 | J. Whitridge Williams, M.D., Dean | Oct. 2 | June 12 | 33 |
| 34 | Univ. of Maryland Sch. of Med. & Coll. of Phys. & Surgs., Baltimore | 584,605 | A | 308 | ... | 123 | ... | 13 | 204 | 32 | 176 | 165 | 165 | 195 | J. M. H. Rowland, M.D., Dean | Oct. 2 | June 1 | 34 |
| | MASSACHUSETTS | | | 787 | 48 | 167 | 11 | 80 | | | | | | | | | | |
| 35 | Boston University School of Medicine, Boston.—H. | 745,139 | A | 68 | 12 | 12 | 6 | 4 | 62 | 32 | 170 | 157 | 151 | 150 | John P. Sutherland, M.D., Dean | Oct. 5 | June 6 | 35 |
| 36 | College of Physicians and Surgeons, Boston[6] | 745,139 | O | 43 | 4 | 11 | 1 | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 36 |
| 37 | Medical School of Harvard University, Boston | 745,139 | A | 334 | ... | 74 | ... | 72 | 286 | 36 | 225 | 225 | 225 | 225 | E. H. Bradford, M.D., Dean | Sept. 25 | June 21 | 37 |
| 38 | Tufts College Medical School, Boston | 745,139 | A | 347 | 33 | 60 | 10 | 4 | 122 | 35 | 170 | 155 | 155 | 155 | Charles F. Painter, M.D., Dean | Sept. 21 | June 15 | 38 |
| | MICHIGAN | | | 832 | 18 | 118 | 3 | 83 | | | | | | | | | | |
| 39 | University of Michigan Medical School, Ann Arbor | 14,994 | A | 306 | 18 | 57 | 7 | 50 | 93 | 35 | 115 | 92 | 107 | 67 | Victor C. Vaughan, M.D., Dean | Oct. 4 | June 28 | 39 |
| 40 | University of Michigan Homeo. Medical School, Ann Arbor.—H. | 14,994 | A | 43 | 1 | 7 | 1 | 3 | 26 | 35 | 115 | 92 | 107 | 67 | W. B. Hinsdale, M.D., Dean | Oct. 4 | June 28 | 40 |
| 41 | Detroit College of Medicine and Surgery, Detroit | 554,717 | A | 180 | ... | 49 | ... | 27 | 171 | 33 | 155 | 150 | 150 | 180 | Joseph H. Hathaway, M.D., Secretary | Sept. 26 | May 31 | 41 |
| | MINNESOTA | | | 248 | 7 | 48 | 2 | 43 | | | | | | | | | | |
| 42 | University of Minnesota Medical School, Minneapolis | 253,460 | A | 248 | 7 | 49 | 2 | 43 | 147 | 34 | 150 | 150 | 150 | 150 | Elias P. Lyon, M.D., Dean | Sept. 27 | June 15 | 42 |
| | MISSISSIPPI | | | 55 | ... | ... | ... | ... | | | | | | | | | | |
| 43 | University of Mississippi Department of Medicine, Oxford[7] | 2,014 | A | 55 | ... | ... | ... | ... | 21 | 33 | 33 | 33 | ... | ... | W. S. Leathers, M.D., Dean | Sept. 20 | May 29 | 43 |
| | MISSOURI | | | 865 | 18 | 150 | 8 | 22 | | | | | | | | | | |
| 44 | University of Missouri School of Medicine, Columbia[8] | 11,271 | A | 71 | 2 | ... | ... | ... | 20 | 34 | 45 | 45 | ... | ... | Guy L. Noyes, M.D., Dean | Sept. 18 | June 7 | 44 |
| 45 | Kansas City College of Medicine and Surgery, Kansas City.—E.[9] | 336,732 | ..... | 98 | 10 | 11 | 1 | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 45 |
| 46 | Southwest School of Medicine and Hospital, Kansas City.—E.[9] | 336,732 | O | 15 | 2 | 6 | 2 | 1 | ... | ... | ... | ... | ... | ... | | ..... | ..... | 46 |
| 47 | National University of Arts and Sciences Med. Dept., St. Louis | 745,983 | O | 145 | 4 | 53 | 2 | ... | 61 | 34 | 140 | 135 | 135 | 135 | J. J. Link, M.D., President | Sept. 20 | June 10 | 47 |
| 48 | St. Louis University School of Medicine, St. Louis | 745,983 | A | 231 | ... | 44 | ... | 4 | 121 | 32 | 155 | 155 | 155 | 155 | Hanan W. Loeb, M.D., Dean | Oct. 2 | June 1 | 48 |
| 49 | Washington University Medical School, St. Louis | 745,983 | A | 92 | ... | 17 | ... | 17 | 94 | 34 | 155 | 150 | 150 | 154 | P. A. Shaffer, M.D., Dean | Sept. 28 | June 14 | 49 |
| | NEBRASKA | | | 269 | 6 | 53 | 2 | 20 | | | | | | | | | | |
| 50 | Lincoln Medical College, Lincoln.—E.[9] | 46,022 | O | 23 | 2 | 7 | 2 | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 50 |
| 51 | John A. Creighton Medical College, Omaha | 185,455 | B | 127 | 1 | 41 | ... | 3 | 53 | 32 | 140 | 135 | 135 | 145 | B. M. Riley, M.D., Secretary | Sept. 22 | June 2 | 51 |
| 52 | University of Nebraska College of Medicine, Omaha | 185,455 | A | 118 | 3 | 20 | 1 | 19 | 59 | 34 | 135 | 130 | 130 | 130 | Irving S. Cutter, M.D., Dean | Sept. 13 | June 9 | 52 |
| | NEW HAMPSHIRE | | | 33 | ... | ... | ... | ... | | | | | | | | | | |
| 53 | Dartmouth Medical School, Hanover | 1,540 | A | 33 | ... | ... | ... | ... | 13 | 36 | 174 | 176 | ... | ... | John M. Gile, M.D., Dean | Sept. 21 | June 28 | 53 |
| | NEW YORK | | | 2673 | 88 | 449 | 18 | 120 | | | | | | | | | | |
| 54 | Albany Medical College, Albany | 102,980 | A | 148 | ... | 48 | ... | 2 | 71 | 33 | 165 | 165 | 165 | 165 | Thomas Ordway, M.D., Dean | Sept. 25 | June 6 | 54 |
| 55 | University of Buffalo Department of Medicine, Buffalo | 461,525 | A | 186 | 16 | 54 | 1 | ... | 107 | 33 | 135 | 130 | 140 | 140 | Thos. H. McKee, M.D., Dean | Sept. 25 | June 8 | 55 |
| 56 | Columbia University College of Phys. and Surgs., New York City | 5,468,190 | A | 419 | ... | 78 | ... | 57 | 250 | 32 | 255 | 250 | 250 | 275 | Samuel W. Lambert, M.D., Dean | Sept. 27 | June 6 | 56 |
| 57 | Cornell University Medical College, New York City | 5,468,190 | A | 150 | 21 | 28 | 4 | 30 | 132 | 34 | 190 | 185 | 185 | 200 | William M. Polk, M.D., Dean | Sept. 27 | June 4 | 57 |
| 58 | Fordham University School of Medicine, New York City | 5,468,190 | A | 256 | ... | 42 | ... | 5 | 110 | 33 | 215 | 216 | 212 | 210 | William P. Healy, M.D., Dean | Sept. 29 | June 11 | 58 |
| 59 | Long Island College Hospital, Brooklyn | 881,005 | A | 272 | ... | 84 | ... | 2 | 127 | 37 | 210 | 205 | 200 | 200 | Otto V. Huffman, M.D., Secretary | Sept. 25 | June 1 | 59 |
| 60 | New York Homeopathic Medical College and Flower Hosp.—H. | 5,468,190 | B | 177 | ... | 33 | ... | 5 | 51 | 33 | 195 | 185 | 175 | 195 | Royal S. Copeland, M.D., Dean | Sept. 26 | June 7 | 60 |
| 61 | New York Medical College and Hospital for Women.—H. | 5,468,190 | O | ... | 47 | ... | 11 | ... | 78 | 33 | 185 | 175 | 160 | 180 | Cornelia C. Brandt, M.D., Dean | Sept. 20 | June 1 | 61 |
| 62 | University and Bellevue Hospital Medical College, New York City | 5,468,190 | A | 395 | ... | 46 | ... | 4 | 180 | 34 | 200 | 200 | 200 | 225 | Samuel A. Brown, M.D., Dean | Sept. 20 | June 6 | 62 |
| 63 | Syracuse University College of Medicine, Syracuse | 152,534 | A | 110 | 5 | 24 | ... | 14 | 80 | 36 | 175 | 175 | 175 | 175 | John L. Heffron, M.D., Dean | Sept. 19 | June 13 | 63 |
| | NORTH CAROLINA | | | 148 | 1 | 6 | ... | ... | | | | | | | | | | |
| 64 | University of North Carolina School of Medicine, Chapel Hill[10] | 1,449 | A | 76 | 1 | ... | ... | ... | 23 | 35 | 120 | 125 | ... | ... | Isaac Hall Manning, M.D., Dean | Sept. 12 | June 6 | 64 |
| 65 | North Carolina Medical College, Charlotte[11] | 38,337 | B | 36 | ... | 8 | ... | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 65 |
| 66 | Leonard Medical School, Raleigh[12] | 19,823 | B | 5 | ... | ... | ... | 5 | 29 | 30 | 30 | ... | ... | ... | George H. Stoddard, M.D., Dean | Sept. 27 | May 9 | 66 |
| 67 | Wake Forest College School of Medicine, Wake Forest[8] | 1,446 | A | 34 | ... | ... | ... | 13 | 35 | 108 | 103 | ... | ... | ... | E. B. Earnshaw, Secretary | Sept. 5 | May 25 | 67 |
| | NORTH DAKOTA | | | 22 | ... | ... | ... | ... | | | | | | | | | | |
| 68 | Univ. of North Dakota School of Med., University (Grand Forks)[8] | 14,827 | A | 22 | ... | ... | ... | ... | 18 | 35 | 50 | 50 | ... | ... | Harley E. French, M.D., Dean | Sept. 25 | June 20 | 68 |
| | OHIO | | | 870 | 21 | 130 | 7 | 30 | | | | | | | | | | |
| 69 | Eclectic Medical College, Cincinnati.—E. | 406,706 | B | 93 | 8 | 22 | 5 | ... | 45 | 32 | 125 | 120 | 120 | 120 | John K. Scudder, M.D., Secretary | Sept. 14 | June 14 | 69 |
| 70 | University of Cincinnati College of Medicine | 406,706 | A | 79 | 9 | 21 | 1 | 9 | 141 | 34 | 150 | 150 | 150 | 170 | Christian R. Holmes, M.D., Dean | Oct. 3 | June 16 | 70 |
| 71 | Western Reserve University School of Medicine, Cleveland | 650,979[a] | A | 178 | ... | 49 | ... | 49 | 96 | 34 | 165 | 150 | 150 | 158 | F. O. Waite, Ph.D., Secretary | Sept. 28 | June 14 | 71 |
| 72 | Ohio State University College of Medicine, Columbus | 209,722 | A | 132 | 3 | 60 | 1 | ... | 98 | 36 | 150 | 150 | 150 | 150 | Eugene F. McCampbell, M.D., Dean | Sept. 19 | June 12 | 72 |
| 73 | Ohio State University College of Homeo. Medicine, Columbus.—H. | 209,722 | O | 28 | 1 | 7 | ... | ... | 17 | 36 | 150 | 150 | 150 | 150 | Claude A. Burrett, M.D., Dean | Sept. 19 | June 23 | 73 |
| | OKLAHOMA | | | 74 | 1 | 20 | ... | 3 | | | | | | | | | | |
| 74 | University of Oklahoma School of Medicine, Norman-Oklahoma City | 88,158 | B | 74 | 1 | 20 | ... | 3 | 59 | 34 | 55 | 45 | 25 | 25 | Leroy Long, M.D., Dean | Sept. 19 | June 5 | 74 |
| | OREGON | | | 78 | 8 | 16 | ... | 2 | | | | | | | | | | |
| 75 | University of Oregon Department of Medicine, Portland | 272,533 | A | 78 | 8 | 16 | ... | 2 | 60 | 33 | 155 | 150 | 150 | 150 | K. A. J. McKenzie, M.D., Dean | Oct. 1 | June 7 | 75 |
| | PENNSYLVANIA | | | 1404 | 67 | 372 | 19 | 33 | | | | | | | | | | |
| 76 | Hahnemann Medical College and Hospital of Philadelphia.—H. | 1,683,564 | A | 96 | ... | 20 | ... | 5 | 60 | 32 | 180 | 180 | 180 | 180 | Wm. A. Pearson, M.D., Dean | Oct. 1 | May 31 | 76 |
| 77 | Jefferson Medical College of Philadelphia | 1,683,564 | A | 525 | ... | 122 | ... | 20 | 146 | 33 | 200 | 200 | 200 | 200 | Rose V. Patterson, M.D., Dean | Sept. 25 | June 2 | 77 |
| 78 | Medico-Chirurgical College of Philadelphia[13] | 1,683,564 | A | 305 | ... | 83 | ... | 4 | ... | ... | ... | ... | ... | ... | | ..... | ..... | 78 |
| 79 | Temple University Department of Medicine, Philadelphia | 1,683,564 | B | 41 | 5 | 11 | 2 | 2 | 85 | 30 | 176 | 171 | 161 | 171 | H. T. Williams, M.D., Registrar | Oct. 18 | June 9 | 79 |
| 80 | University of Pennsylvania School of Medicine, Philadelphia | 1,683,564 | A | 317 | ... | 74 | ... | 50 | 179 | 35 | 223 | 210 | 210 | 214 | William Pepper, M.D., Dean | Sept. 29 | June 20 | 80 |
| 81 | Woman's Medical College of Pennsylvania, Philadelphia | 1,683,564 | A | ... | 55 | ... | 17 | 2 | 59 | 34 | 192 | 178 | 182 | 179 | Clara Marshall, M.D., Dean | Sept. 20 | June 6 | 81 |
| 82 | University of Pittsburgh School of Medicine, Pittsburgh | 571,084 | A | 104 | 7 | 22 | ... | 10 | 108 | 34 | 225 | 250 | 250 | 325 | Thomas S. Arbuthnot, M.D., Dean | Sept. 25 | June 13 | 82 |
| | SOUTH CAROLINA | | | 61 | ... | 16 | ... | 5 | | | | | | | | | | |
| 83 | Medical College of the State of South Carolina, Charleston | 60,427 | A | 61 | ... | 16 | ... | 5 | 60 | 32 | 140 | 140 | 140 | 140 | Robert Wilson, Jr., M.D., Dean | Oct. 2 | June 7 | 83 |
| | SOUTH DAKOTA | | | 12 | ... | ... | ... | ... | | | | | | | | | | |
| 84 | University of South Dakota College of Medicine, Vermilion[8] | 2,187 | A | 12 | ... | ... | ... | ... | 10 | 35 | 60 | 60 | ... | ... | Christian P. Lommen, B.S., Dean | Sept. 19 | June 14 | 84 |
| | TENNESSEE | | | 111 | 6 | 282 | 4 | 33 | | | | | | | | | | |
| 85 | Lincoln Memorial University Medical Department, Knoxville[14] | 33,900 | B | 21 | ... | 14 | ... | ... | ... | ... | ... | ... | ... | ... | | ..... | ..... | 85 |
| 86 | University of Tennessee College of Medicine, Memphis | 146,113 | A | 156 | 3 | 59 | 1 | 7 | 110 | 34 | 105 | 100 | 100 | 125 | H. T. Brooks, M.D., Dean | Sept. 21 | June 6 | 86 |
| 87 | University of West Tennessee College of Med. and Surg., Memphis[15] | 146,113 | O | 27 | ... | 9 | ... | 3 | 22 | 30 | 65 | 65 | 50 | 65 | M. V. Lynk, M.D., Dean | Sept. 14 | May 8 | 87 |
| 88 | Meharry Medical College, Nashville | 115,578 | B | 295 | 6 | 90 | 3 | 9 | 25 | 30 | 70 | 70 | 70 | 80 | George W. Hubbard, M.D., Dean | Sept. 19 | May 3 | 88 |
| 89 | Vanderbilt University Medical Department, Nashville | 115,578 | A | 212 | ... | 90 | ... | 21 | 84 | 38 | 165 | 180 | 185 | 205 | Lucius E. Burch, M.D., Dean | Oct. 2 | June 13 | 89 |
| | TEXAS | | | 312 | 12 | 82 | 1 | 18 | | | | | | | | | | |
| 90 | Baylor University College of Medicine, Dallas | 113,482 | A | 93 | 1 | 25 | ... | 3 | 58 | 32 | 120 | 115 | 115 | 125 | Edward H. Cary, M.D., Dean | Oct. 2 | May 31 | 90 |
| 91 | Fort Worth School of Medicine, Fort Worth | 94,494 | B | 50 | ... | 7 | ... | 2 | 78 | 34 | 114 | 116 | 108 | 125 | Samuel A. Woodward, M.D., Dean | Sept. 18 | June 7 | 91 |
| 92 | University of Texas Department of Medicine, Galveston | 41,076 | A | 204 | 11 | 34 | 1 | 11 | 32 | 32 | 60 | 35 | 15 | 10 | William S. Carter, M.D., Dean | Oct. 1 | May 31 | 92 |
| | UTAH | | | 22 | ... | ... | ... | ... | | | | | | | | | | |
| 93 | University of Utah School of Medicine, Salt Lake City[8] | 118,567 | A | 22 | ... | ... | ... | ... | 22 | 34 | 74 | 79 | ... | ... | Perry G. Snow, M.D., Dean | Sept. 18 | June 7 | 93 |
| | VERMONT | | | 76 | ... | 18 | ... | 1 | | | | | | | | | | |
| 94 | University of Vermont College of Medicine, Burlington | 21,247 | A | 76 | ... | 18 | ... | 1 | 45 | 36 | 145 | 145 | 145 | 170 | H. C. Tinkham, M.D., Dean | Sept. 27 | June 27 | 94 |
| | VIRGINIA | | | 280 | ... | 104 | ... | 18 | | | | | | | | | | |
| 95 | Medical College of Virginia, Richmond | 154,474 | A | 266 | ... | 88 | ... | 8 | 122 | 34 | 154 | 154 | 154 | 164 | Stuart McGuire, M.D., Dean | Sept. 20 | June 5 | 95 |
| 96 | University of Virginia Department of Medicine, Charlottesville | 6,765 | A | 14 | ... | 21 | ... | 11 | 35 | 30 | 150 | 140 | 140 | 140 | Theodore Hough, M.D., Dean | Sept. 14 | June 13 | 96 |
| | WEST VIRGINIA | | | 17 | ... | ... | ... | ... | | | | | | | | | | |
| 97 | West Virginia University School of Medicine, Morgantown[8] | 12,289 | B | 17 | ... | ... | ... | ... | 11 | 33 | 33 | 10 | ... | ... | John N. Simpson, M.D., Dean | Sept. 18 | June 17 | 97 |
| | WISCONSIN | | | 177 | 11 | 45 | 1 | 3 | | | | | | | | | | |
| 98 | University of Wisconsin Medical School, Madison[8] | 20,084 | A | 81 | 10 | ... | ... | ... | 20 | 36 | 70 | 70 | ... | ... | Charles S. Bardeen, M.D., Dean | Sept. 18 | June 20 | 98 |
| 99 | Marquette University School of Medicine, Milwaukee | 423,062 | A | 96 | 1 | 45 | 1 | 3 | 105 | 36 | 175 | 170 | 170 | 185 | J. Van de Erve, M.D., Asso. Dean | Sept. 18 | June 14 | 99 |
| | CANADA | | | 1667 | 47 | 202 | 4 | 33 | | | | | | | | | | |
| 100 | University of Alberta Faculty of Medicine, Edmonton, Alta.† | 60,000 | ... | 32 | 3 | ... | ... | ... | 18 | 30 | 60 | 85 | 85 | ... | Cecil R. Race, A.B., Registrar | Oct. 2 | May 16 | 100 |
| 101 | Dalhousie University Faculty of Medicine, Halifax, N. S. | 46,619 | B | 62 | 6 | 11 | 1 | ... | 33 | 32 | 110 | 110 | 110 | 110 | D. Fraser Harris, M.D., Secretary | Sept. 18 | May 10 | 101 |
| 102 | Queen's University Faculty of Medicine, Kingston, Ont. | 12,874 | O | 204 | ... | 11 | 4 | 3 | 39 | 30 | 105 | 105 | 105 | 105 | J. C. Connell, M.D., Dean | Sept. 13 | April 25 | 102 |
| 103 | University of Toronto Faculty of Medicine, Toronto, Ont. | 376,538 | A | 491 | 26 | 90 | 8 | 13 | 185 | 33 | 150 | 150 | 150 | 150 | A. Primrose, M.D., Dean | Sept. 28 | May 28 | 103 |
| 104 | Western University Faculty of Medicine, London, Ont. | 46,300 | O | 68 | ... | 16 | ... | 3 | 59 | 30 | 120 | 115 | 115 | 115 | Paul C. McKibben, Secretary | Oct. 2 | May 18 | 104 |
| 105 | McGill University Faculty of Medicine, Montreal, Que. | 472,712 | A | 217 | ... | 32 | ... | 6 | 121 | 32 | 174 | 174 | 171 | 174 | John W. Scane, M.D., Registrar | Oct. 1 | June 6 | 105 |
| 106 | Montreal School of Medicine and Surgery, Montreal, Que. | 472,712 | B | 173 | ... | 17 | ... | ... | 75 | 36 | 110 | 118 | 128 | 128 | L. D. Mignault, Registrar | Oct. 1 | June 30 | 106 |
| 107 | Laval University Faculty of Medicine, Quebec, Que. | 78,190 | B | 31 | ... | 10 | ... | 3 | 24 | 34 | 60 | 60 | 60 | 60 | Edwin Turcot, M.D., Dean | Sept. 13 | June 1 | 107 |
| 108 | University of Manitoba, Manitoba Medical College, Winnipeg | 200,000 | B | 122 | 2 | 19 | ... | 6 | 58 | 33 | 155 | 150 | 150 | 150 | H. H. Chown, M.D., Dean | Sept. 27 | May 1 | 108 |

H.—Homeopathic; E.—Eclectic. * Give only the first two years of the medical course. † Gives the first three years of the five-year medical course.

1. Has merged with the University of California Medical School, but is continuing until the three remaining classes have been graduated.
2. This college is reported to have been closed and its building has been leased for other purposes.
3. No reports obtained. Figures are for session of 1914-1915. Official reports show this college is not recognized by the licensing boards of thirty-two states.
4. A night school advertising as an "accredited" institution. Official reports show it is not recognized by the licensing boards of thirty-two states.
5. Heretofore known as the Bennett Medical College.
6. Official reports show this college is not recognized by the licensing boards of thirty-three states.
7. This is an offshoot from the Eclectic Medical University and apparently took all the students, since neither students nor graduates are reported for the latter.
8. This is the successor to the Kansas City Hahnemann Medical College and occupies the same building. It has not been learned whether the school will reopen. It is reported as not in good standing with the Missouri State Board of Health.
9. It has not been learned whether this college will reopen. Reported not recognized by the licensing boards of twenty-nine states.
10. Merged in 1914 with the Medical College of Virginia, but retains a nominal existence until 1917, when its last class will graduate.
11. Has been merged with the University of Pennsylvania Medical School. Will hereafter be known as the "Medico-Chirurgical College and Hospital, Graduate School of Medicine of the University of Pennsylvania."
12. Merged in 1914 with the University of Tennessee College of Medicine, but retains a nominal existence until 1917, when its last class will graduate.
13. A school for the colored race. It has been reported as not recognized by the licensing boards of thirty-four states.

# Bulletin of The University of Minnesota

# THE COLLEGE OF DENTISTRY

## 1916-1917

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Minneapolis, Minn.

## 1916

### JULY

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### AUGUST

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### SEPTEMBER

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## 1917

### JANUARY

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### FEBRUARY

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |

| | | | |
|---|---|---|---|
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 p.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

# COLLEGE OF DENTISTRY

## FACULTY

GEORGE EDGAR VINCENT, Ph.D., LL.D., President 1005 5th St. S. E.
CYRUS NORTHROP, LL.D., President Emeritus 519 10th Ave. S. E.
ALFRED OWRE, B.A., M.D., C.M., D.M.D., Dean, Professor of Theory and Practice of Dentistry and Dental Metallurgy University of Minnesota

RICHARD OLDING BEARD, M.D., Associate Professor of Physiology University of Minnesota
ELEXIOUS T. BELL, B.S., M.D., Assistant Professor of Pathology 215 Walnut St. S. E.
PETER J. BREKHUS, B.A., D.D.S., Associate Professor of Crown and Bridge Work 3719 Pleasant Ave.
EDGAR D. BROWN, Phm.D., M.D., Associate Professor of Pharmacology 3525 3rd Ave. S.
OSCAR COOPERMAN, D.D.S., Assistant Professor in Prosthetic Dentistry and Dental Anatomy 638 6th Ave. N.
RALPH W. COUNTRYMAN, D.D.S., Assistant Professor in Operative Dentistry 401 Reid Corner
NORMAN J. COX, B.S., D.M.D., Assistant Professor of Operative Dentistry 986 15th Ave. S. E.
GEORGE M. DAMON, D.D.S., Associate Professor of Prosthetic Dentistry and Dental Anatomy 3340 Portland Ave.
BROR E. DAHLGREN, D.M.D., Associate Professor of Theory and Practice 1708 Portland Ave.
IRA HARRIS DERBY, Ph.D., Assistant Professor of Chemistry 2157 Commonwealth Ave., St. Paul
J. FRANKILN EBERSOLE, M.A., Assistant Professor of Economics 312 State St. S. E.
CHARLES A. ERDMANN, M.D., Associate Professor of Applied Anatomy 612 9th Ave. S. E.
CARL O. FLAGSTAD, D.D.S., Assistant Professor in Prosthetic Dentistry, Orthodontia, and Dental Anatomy 229 Cedar Ave.
GEORGE B. FRANKFORTER, Ph.D., Professor of Chemistry and Dean of the School of Chemistry 525 E. River Road
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CHARLES A. GRIFFITH, D.D.S., Associate Professor of Oral Surgery 1917 Hamline Ave.

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THOMAS G. LEE, B.S., M.D., Professor of Comparative Anatomy 509 E. River Road

BERNARD LENTZ, 1st Lieutenant, 21st Infantry, U. S. A., Professor of Military Science, Head of Department of Military Science and Tactics

ELMER J. LUND, Ph.D., Assistant Professor of Zoology

ELIAS P. LYON, Ph.D., M.D., Professor of Physiology and Director of the Department 421 Union St. S. E.

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DAVID CROWTHER, Instructor in Dental Mechanics

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BERT A. ROSE, Band Instructor 710 7th St. S. E.
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ROY E. CRUZEN, Assistant in Physiology
RALPH W. DELTON, Student Assistant in Prosthetic Dentistry
HOUGHTON HOLLIDAY, Assistant in Research
JOHN A. KITTELSON, Assistant in Anatomy
CHARLES H. PASKE, Student Assistant in Crown and Bridge Work
CLARENCE I. LILLEHEI, Student Assistant in Operative Dentistry
JAMES C. MCKINLEY, Assistant in Anatomy
ADOLPH RINGOEN, Assistant in Animal Biology
LYLE ROBERTS, Assistant in Physiology

RAY SHANNON, M.S., Assistant in Pathology and Bacteriology
HELEN SANBORN, Assistant in Animal Biology
CHESTER A. STEWART, Assistant in Anatomy
FLORIEN VAUGHN, Assistant in Anatomy
LEHMAN WENDELL, Student Assistant in Dental Anatomy
EARL C. WEST, Assistant in Research

# GENERAL INFORMATION

## CURRICULUM

The course in the College of Dentistry leads to the degree of Doctor of Dental Surgery and covers a period of four years collegiate study.

For statements of entrance requirements, registration, and fees, see Bulletin of General Information.

For schedule of lectures, announcements, changes in college rules, etc., see bulletin board. The Rules for the Guidance of Students are printed in a separate booklet; in this will also be found a list of the required instruments.

## COMBINED ACADEMIC-DENTISTRY COURSE

The first three years of the Arts and Dentistry course are given in the College of Science, Literature, and the Arts and the last three years in the College of Dentistry. It leads to the degree of Bachelor of Arts in four years and the degree of Doctor of Dental Surgery in six years.

Students registering in this course must, before completing their registration, choose a major line of work and secure the signature of an adviser in that department. In order to complete the academic portion of their work they must obtain ninety (90) credits, including a major and two minors, one in each of the groups A, B, C (see Bulletin of the College of Science, Literature, and the Arts); and they must have an average of *good* in at least one-half of their work. The third year of Dentistry counts as equivalent to thirty (30) credits toward the B.A. degree, provided the student receives an average of *good* in one-half of such year's work.

No student may be admitted to the College of Dentistry as a candidate for the degrees of Bachelor of Arts and Doctor of Dental Surgery until he has satisfied the foregoing requirements.

## ADMISSION

### *General Requirements*

1. English, three units.
2. Chemistry,* one unit, and Manual Training recommended.
3. Mathematics: Elementary Algebra, one unit; Plane Geometry, one unit.
4. Enough additional work to make in all fifteen units of which not more than four may be in Group F.

On account of the limited capacity of the College of Dentistry, not more than ninety freshmen can be admitted. Applications for admission should be in the Registrar's office not later than July 25.

* Those who have had good training in preparatory Chemistry will take a combined course of ten credits in General Chemistry and Qualitative Analysis.

Candidates will be selected according to quantity and quality of preparation, and when necessary their fitness shall be determined by competitive examination and conference with the Student Work Committee.

All other qualifications being equal, residents of Minnesota will be given prior consideration for vacancies existing at the date of their application.

All freshmen students, entering the College of Dentistry must confer with the Dean of the College some time before their matriculation or immediately after.

## EXPENSES

| | |
|---|---|
| Freshman year | |
| Annual incidental fee | $100.00 |
| Instruments | 125.00 |
| Books | 25.00 |
| Sophomore year | |
| Annual incidental fee | $175.00 |
| Instruments | 200.00 |
| Books | 35.00 |
| Junior year | |
| Annual incidental fee | $175.00 |
| Instruments | 75.00 |
| Books | 25.00 |
| Senior year | |
| Annual incidental fee | $175.00 |
| Instruments | 25.00 |
| Books | 15.00 |

## SUMMER SESSION

A Summer Course of two months is offered in the Departments of Anatomy, Animal Biology, Bacteriology, Chemistry, Crown and Bridge Work, Dental Anatomy, Operative Dentistry, Orthodontia, Physiology, and Prosthetic Dentistry.

## GRADUATE WORK

Instruction in all the departments of the College of Dentistry will be given to graduate practitioners upon registration for not less than one quarter of the College year.

Graduate Students must comply with the rules and regulations of the College of Dentistry.

## MILITARY DRILL

Military Drill will be required of all men in the freshman and sophomore classes.

## PHYSICAL EDUCATION

A course is offered in Physical Education for Men and Women.

## RULES AND REGULATIONS

### *Examinations, Standings, and Conditions*

No student with an entrance condition will be allowed to register for any second-year subject, nor will any student with any first-year condition or failure be allowed to register for a third-year subject.

No student will be allowed to omit any freshman work in order to make up entrance conditions, except by special permission of the department affected.

Students will not be permitted to substitute private work in any branch for the regular college courses.

Final examination in every required subject is held at the close of the work at the end of the semester or quarter, according to the extent of the course given. The examinations at the end of semester or quarter are only for those who are taking the courses, while the condition examinations are only for those who are attempting to remove conditions.

The final standing of any student in a given subject shall be determined as the result of (a) practical work (laboratory or clinical), (b) recitations, and (c) oral or (d) written examinations. All of these factors shall be taken into consideration in making up the final grading in any subject.

Students' standing shall be determined at the end of each quarter by a conference of the departments in which the work is pursued during that year.

All standings shall be reported officially to and from the Registrar's Office at the end of each semester.

A uniform marking system has been adopted for the whole University. Four passing grades, indicated by the symbols *A, B, C,* and *D,* represent differing degrees of merit. The symbol *E* represents a condition, which may be removed by examination and by such supplementary work as the department imposing it may require. *F* stands for a failure and calls for a repetition of the work in course. *I* stands for incomplete and grants the student further time for the completion of the required work.

Regular examinations for the removal of conditions shall be given at no other time than (1) the week following the Easter recess and (2) the registration week in September.

Students having conditions will be subject to the action of the Student Work Committee.

A condition not removed at the first opportunity becomes a failure subject to the rules governing failures.

Failures necessitate the taking of the work again in class.

A student carrying less than the complete schedule of work may pay fees on a clock-hour basis.

A student who is conditioned in the majority of the subjects given in any year will become a *failed* student and must repeat the entire work of that year.

Students who carry *failures* into a succeeding year may find a resultant conflict of study hours; in that event they will give preference to the unfinished studies of the lower conflicting course.

Any student reported below grade in sixty per cent of his work at the middle or close of the first semester or middle of the second semester shall be dropped from the rolls and shall not be allowed to re-enter until the opening of the following year.

*Probation.*—Such student shall then be allowed to enter on probation; and, if reported by the middle of the semester or after as delinquent in two or more subjects, he shall be dropped without further action for that year.

*Work limited.*—Students pursuing any continuous subject who have done such poor work in the first semester as to receive a condition or failure in such subject, shall not be allowed to elect another subject in place of that in which the condition or failure was received, but shall be required to devote their full time to the remaining subjects of the course.

Exception to this rule shall be made only by the Committee on Students' Work after full investigation.

*Electives.*—A student may elect a subject in another department if his standing in the regular course is satisfactory and on approval of the Student Work Committee.

### *Attendance and Discipline*

All lectures, laboratory, and infirmary courses and clinics must be taken in full and must invariably be entered upon during the week in which they begin.

All students are required to provide themselves with instruments, books, tools, and materials as prescribed by the college.

Tardiness and absences are controlled by the principle that each student must do the full work of the course.

No student whose absences in any semester exceed four weeks in the aggregate shall be admitted to final examination without special permission of the Students' Work Committee.

Any student's registration may be refused or cancelled by the Registrar at the request of the Students' Work Committee on account of absences, indifference to study, poor scholarship, disorderly or immoral conduct, and for dishonesty in classroom or laboratory work.

The practice of dentistry by students, except under the direct supervision of a preceptor, is prohibited by law in the State of Minnesota. Students violating this law will be suspended or expelled.

Except in cases of required work students are not allowed to obligate themselves in the Military Department, band, or other college activities, without permission from the Faculty.

### *Eligibility Regulations*

No student shall take part in any public performance of a dramatic or musical club, or be eligible to election or appointment to official positions upon the boards of student publications, or take part in intercollegiate debates or oratorical contests, unless he has a clear record at the time.

## ADVANCED STANDING

Applicants for advanced standing must present satisfactory evidence of possessing the preliminary educational qualifications required of the class they desire to enter.

They must also satisfy the professors of the branches from which they wish to be exempt, that the work pursued by them in other institutions was equal in scope and amount to that passed by the class they propose to enter.

No credits are accepted unconditionally, the Faculty reserving the privilege of examining any applicant when deemed necessary.

All certificates pertaining to advanced standing must be presented to the Dean, who will send them to the respective professors for acceptance or report of further requirements for acceptance.

## 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 having satisfied 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.

# COURSE OF STUDY

| | *First Semester* | | *Second Semester* | | *Total* | |
|---|---|---|---|---|---|---|
| Freshman Year | Credits | Hours | Credits | Hours | Credits | Hours |
| Anatomy, Dental | 1 | 16 | 2 | 64 | | |
| Animal Biology | 3 | 96 | 3 | 96 | | |
| *Chemistry | 5 | 160 | 5 | 160 | | |
| English, Rhetoric | 3 | 48 | 3 | 48 | | |
| Military Science and Tactics | | | | | | |
| Prosthetic Lecture and Technique | 3 | 112 | 2 | 64 | | |
| **Technical Drawing | 2 | 96 | 2 | 96 | | |
| | 17 | 528 | 17 | 528 | 32 | 1,056 |
| Sophomore Year | | | | | | |
| Anatomy, Gross | 5 | 144 | 5 | 144 | | |
| Anatomy, Histology and Embryology | 4 | 128 | | | | |
| Anatomy, Dental | 3 | 96 | | | | |
| Chemistry, Organic | 3 | 96 | | | | |
| Military Science and Tactics | | | | | | |
| Operative Dentistry | | | 4 | 160 | | |
| Physiology and Physiological Chemistry | | | 7 | 192 | | |
| Prosthetic Lectures and Technique | 3 | 144 | 2 | 96 | | |
| | 18 | 608 | 18 | 592 | 36 | 1,200 |
| Junior Year | | | | | | |
| Bacteriology, General and Special | 4 | 112 | | | | |
| Clinical Practice | 4 | 192 | 10 | 480 | | |
| Crown and Bridge Lec. and Technique | 4 | 160 | | | | |
| Dental Metallurgy | 1 | 16 | | | | |
| Operative Dentistry Lec. and Rec. | 1 | 16 | 1 | 16 | | |
| Orthodontia Technique | 2 | 96 | | | | |
| Pathology, General and Special | | | 4 | 112 | | |
| Pharmacology | | | | 48 | | |
| Prosthetic Dentistry Lec. and Rec. | 2 | 32 | | | | |
| | 18 | 624 | 18 | 656 | 36 | 1,280 |
| Senior Year | | | | | | |
| Clinical Practice | 12 | 576 | 12 | 576 | | |
| Crown and Bridge Work Lec. and Rec. | 1 | 16 | 1 | 16 | | |
| Operative Dentistry Lec. and Rec. | 1 | 16 | | | | |
| Oral Surg., Clin. Path. and Radiog. Lec. and Rec. | | | 2 | 32 | | |
| Orthodontia Lectures and Recitations | 1 | 16 | 1 | 16 | | |
| Pathology and Therapeutics | 3 | 48 | | | | |
| Theory and Practice of Dentistry and Conference Course in Applied Economics, Jurisprudence, Psychology, Ethics and Art | | | 2 | 32 | | |
| | 18 | 672 | 18 | 672 | 36 | 1,344 |
| | | | | | 142 | 4,880 |

* Students who have had Elementary Chemistry will be allowed four advanced credits.

** Substitute allowed by the Student Work Committee.

One credit hour may be either one recitation hour through one semester, two laboratory hours with outside work, or three laboratory hours without outside work. One semester—sixteen weeks, one week—forty-eight hours.

# DEPARTMENTAL STATEMENTS

Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e. g., 5-6) indicates courses continuing through the year. In the case of courses repeated the second semester, the suffix *a* indicates first semester; the suffix *b*, second semester.

## ANATOMY

Professors CLARENCE M. JACKSON, THOMAS G. LEE; Associate Professor CHARLES A. ERDMANN; Assistants CHESTER A. STEWART, JOHN A. KITTELSON, FLORIEN VAUGHN, JAMES C. MCKINLEY.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 5-6. | Gross Anatomy | 8 | Fr. | An. Biol. |
| 7. | Histology and Embryology | 4 | Fr. | An. Biol. |

5-6. GROSS ANATOMY. Lectures, recitations, demonstrations, and laboratory work in gross human anatomy. Includes descriptive anatomy, including osteology, with special emphasis upon the skull and the digestive tract; later a complete and careful dissection of the head and neck. Open only to dental students and especially arranged for their needs. JACKSON, ERDMANN, VAUGHN.

7. HISTOLOGY AND EMBRYOLOGY. Lectures, recitations, laboratory work, and demonstrations. Special emphasis will be laid upon the knowledge of the development and structure of the head, mouth, jaw, teeth, and other portions of the digestive system. JACKSON, LEE, STEWART, KITTELSON, MCKINLEY.

## ANIMAL BIOLOGY

Professors HENRY FRANCIS NACHTRIEB, CHARLES P. SIGERFOOS; Assistant Professor ELMER J. LUND; Instructors GEORGE DELVIN ALLEN; Assistants ADOLPH RINGOEN, HELEN SANBORN.

### COURSES

*Introductory Course*

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | General Zoology | 6† | All | None |

† Both semesters must be completed before credit is given for the first semester.

### INTRODUCTORY COURSE

1-2. GENERAL ZOOLOGY. A survey of the animal kingdom, emphasizing the principles of structure, physiology, embryology, classification, and evolution of animals. Textbook, lectures, and quizzes. SIGERFOOS, LUND, ALLEN, RINGOEN, SANBORN.

## CHEMISTRY

Professor GEORGE B. FRANKFORTER; Assistant Professor IRA H. DERBY; Instructors LILLIAN COHEN, WOLF KRITCHEVSKY, EARLE K. STRACHAN.

### COURSES

*Division of General and Inorganic Chemistry*

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 21-22. | Inorganic and Qualitative Chemistry | 10† | Those entering without Chemistry | None |
| 3-4. | Adv. Gen. Chem. and Qualitative Analysis | 6† | Fr., soph., jr. | Entrance credit in Chemistry |

† Both semesters must be completed before credit is given for the first semester.

21-22. INORGANIC AND QUALITATIVE CHEMISTRY. This includes a study of the non-metals, metals, and qualitative analysis, together with a thoro discussion of the fundamental laws and theories of chemistry. FRANKFORTER, COHEN.

3-4. ADVANCED GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. Lectures and laboratory work. A discussion of the general chemical theories and laws, with qualitative analysis. FRANKFORTER, DIETRICHSON, and Assistants.

## CROWN AND BRIDGE WORK

Professor FORREST H. ORTON; Associate Professors PETER J. BREKHUS, ALFRED A. PAGENKOPF, GEORGE W. REYNOLDS, AMOS S. WELLS, CHARLES A. WIETHOFF; Assistant Professors WILLIAM MCDOUGALL, WILLIAM A. ROLL; Instructors EVERETT E. MACGIBBON, HERBERT C. NELSON, CARL OTTO.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Crown and Bridge Technique | 4 | Jr. | Dent. Anat. 3 |
| 2. | Crown and Bridge Technique | 3 | Jr. | 1 |
| 3. | Crown and Bridge Practice | 4 | Sr. | 2 |
| 4. | Crown and Bridge Practice | 4 | Sr. | 3 |

1. CROWN AND BRIDGE TECHNIQUE. A course of lectures, demonstrations, and laboratory work that includes all the more important forms of crowns and bridges. PAGENKOPF, WELLS, REYNOLDS, NELSON, OTTO, MACGIBBON.

2. CROWN AND BRIDGE TECHNIQUE. Continuation of Course 1 as outlined above. PAGENKOPF, WELLS, REYNOLDS, NELSON, OTTO, MACGIBBON.

3. CROWN AND BRIDGE PRACTICE. A course of lectures and clinical practice covering the entire field of crown and bridge work. ORTON, BREKHUS, MCDOUGALL, WIETHOFF, ROLL.

4. CROWN AND BRIDGE PRACTICE. Continuation of Course 3 as outlined above. ORTON, BREKHUS, McDOUGALL, WIETHOFF, ROLL.

## DENTAL ANATOMY

Associate Professor GEORGE M. DAMON; Assistant Professors OSCAR COOPERMAN, CARL O. FLAGSTAD, CARL H. PETRI, CHARLES E. RUDOLPH; Instructors LEE H. HARKER, PAUL S. PARKER.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Dental Anatomy | 1 | Fr. | None |
| 2. | Dental Anatomy | 2 | Fr. | 1 |
| 3. | Dental Anatomy | 3 | Soph. | 2 |

1. DENTAL ANATOMY. A course of lectures and recitations on the anatomy and nomenclature of the teeth. DAMON.

2. DENTAL ANATOMY. The course will consist of lectures, recitations, and such laboratory work as drawing, dissection, modeling, and carving of the teeth. DAMON, COOPERMAN, FLAGSTAD, PETRI, RUDOLPH, HARKER, PARKER.

3. DENTAL ANATOMY. Continuation of Course 1 as outlined above. DAMON, COOPERMAN, FLAGSTAD, PETRI, RUDOLPH, HARKER, PARKER.

## DENTAL METALLURGY

Professors ALFRED OWRE, HARRY C. LAWTON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Dental Metallurgy | 1 | Jr. | Chem. 21-22 |

1. DENTAL METALLURGY. Lectures, recitations, and demonstrations, taking up the most important metals with special reference to those used in dentistry. OWRE, LAWTON.

## DRAWING AND DESCRIPTIVE GEOMETRY

Professor WILLIAM H. KIRCHNER; Instructors CHARLES H. BLITMAN, RUTCHER SKAGERBERG.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 21-22. | Technical Drawing | 4 | All | None |

21-22. TECHNICAL DRAWING. Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings, and translations. KIRCHNER, BLITMAN, SKAGERBERG.

## MILITARY SCIENCE AND TACTICS

Professor and Commandant BERNARD LENTZ; Assistant Commandant and Brigade Adjutant WALTER F. RHINOW; Band Instructor BERT ROSE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Military Drill | None | Fr. | None |
| 3-4. | Military Drill | None | Soph. | 1 yr. Drill |
| 5-6. | Military Drill | 3* | Jr., sr. | 2 yrs. Drill |
| 8. | Military Science | 2† | Jr., sr. | 2 yrs. Drill |

* No student may receive more than a total of six credits for elective work in both Physical Education and Military Drill.

† If taken in connection with Course 5-6.

1-6. MILITARY DRILL. Required of all men in the freshman and sophomore classes. Students are cautioned to report for the first drill and inform themselves of the requirements of the department.

1-2. Freshman: Practical instruction in schools of the soldier, company, and battalion; signals, ceremonies; first aid.

3-4. Sophomore: Practical and theoretical instruction in schools of the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

5-6. May be taken voluntarily by others outside of the freshman and sophomore classes. No credit will be allowed for such drill for less than one year.

8. MILITARY SCIENCE. Instruction in advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

## OPERATIVE DENTISTRY

Professors JAMES M. WALLS, HENRY S. GODFREY; Associate Professors ROBERT O. GREEN, HERMAN A. MAVES; Assistant Professors RALPH W. COUNTRYMAN, NORMAN J. COX, RICHARD S. MAYBURY, MARK O. PATTRIDGE, JOSEPH F. SHELLMAN; Instructors CLINTON H. BEERS, MAX E. ERNST, WILLIAN C. NAEGELI, JOSEPH M. LITTLE, RAYMOND R. HENRY.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Operative Technique | 4 | Soph. | Dent. Anat. 3 |
| 3. | Operative Practice | 3 | Jr. | 1 |
| 4. | Operative Practice | 4 | Jr. | 2 |
| 5. | Operative Practice | 4 | Sr. | 3 |
| 6. | Operative Practice | 4 | Sr. | 4 |

2. OPERATIVE TECHNIQUE. This course consists of lectures, recitations, demonstrations, and laboratory work of a technical nature. WALLS, GREEN, COUNTRYMAN, SHELLMAN, BEERS, NAEGELI, HENRY

3. OPERATIVE PRACTICE. This course consists of lectures, recitations, and clinical practice. WALLS, GREEN, COUNTRYMAN, SHELLMAN, BEERS, NAEGELI, HENRY.

4. OPERATIVE PRACTICE. A course of lectures, recitations, conference work, demonstrations, and clinical practice covering the entire field of operative dentistry. WALLS, GODFREY, MAVES, COX, ERNST, LITTLE, MAYBURY, PATTRIDGE.

5. OPERATIVE PRACTICE. Continuation of Course 3 as outlined above. WALLS, GODFREY, MAVES, COX, ERNST, LITTLE, MAYBURY, PATTRIDGE.

6. OPERATIVE PRACTICE. A course in the general practice of operative dentistry. WALLS, GODFREY, MAVES, COX, ERNST, LITTLE, MAYBURY, PATTRIDGE.

## ORAL SURGERY

Professor THOMAS B. HARTZELL; Associate Professor CHARLES A. GRIFFITH; Assistant Professor RAY R. KNIGHT; Instructors K. PAUL CARSON, WILLIAM A. GREY, HAROLD J. LEONARD, MARY V. HARTZELL.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Oral Surgery Practice | 1 | Jr. | Path., Ther. |
| 2. | Oral Surgery | 2 | Sr. | 1 |

1. ORAL SURGERY. This course is taught by lectures, recitations, and practical demonstrations, covering the field of oral diseases, physical diagnosis, anesthesia, urinalysis, and a clinical course in pyorrhea treatment. HARTZELL, GRIFFITH, KNIGHT, LEONARD, CARSON, GREY, HARTZELL.

2. ORAL SURGERY. Continuation of Course 1 as outlined above. GRIFFITH, KNIGHT, LEONARD, HARTZELL, CARSON, GREY.

## ORTHODONTIA

Professor OSCAR A. WEISS; Associate [illegible] AM F. LASBY, HARRY C. LAW[illegible] [illegible]sist[illegible] [illegible] ARL [illegible] STAD; Instructor BERT G. ANDERSON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Orthodontia Technique | 2 | Jr. | Pros. Tech. 4 |
| 3. | Orthodontia Practice | 1 | Jr. | 1 |
| 4. | Orthodontia Practice | 1 | Sr. | 2 |

2. ORTHODONTIA TECHNIQUE. A course of lectures, recitations, and laboratory work in the technique of steel and the making of regulating appliances. WEISS, LAWTON, ANDERSON.

3. ORTHODONTIA PRACTICE. A course of lectures, recitations, and clinical work on the theory and practice of orthodontia. Every student is re-

quired to treat at least one irregularity of the teeth. WEISS, LASBY, FLAGSTAD, ANDERSON.

4. ORTHODONTIA PRACTICE. A continuation of Course 2 as outlined above. WEISS, LASBY, ANDERSON.

## PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

Professor HAROLD E. ROBERTSON; Associate Professors ELEXIOUS T. BELL, WINFORD P. LARSON; Assistant Professor MOSES BARRON; Instructors ARTHUR T. HENRICI, WILLIAM C. JOHNSON, ALBERT C. POTTER, MARGARET WARWICK; Assistant RAY SHANNON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 51-52. | Pathology, General and Special.... | 4 | Jr. | His. 51 |
| 58-59. | Bacteriology, General and Special.. | 4 | Jr. | Chem. 21-22 |

51. GENERAL PATHOLOGY. The study of pathologic processes; of regeneration and repair; and of tumors. ROBERTSON, BELL, BARRON, POTTER, WARWICK.

52a,b. SPECIAL PATHOLOGY. Studies of museum preparations and of material from autopsies and operations; the pathology of infectious diseases, as tuberculosis, syphilis, typhoid fever, etc.; the special pathology of various organs. ROBERTSON, BELL, POTTER, WARWICK.

58. GENERAL BACTERIOLOGY. Preparation of culture media. The morphology of bacteria; methods of staining and identification; anaerobic bacteria; principles of sterilization and disinfection; examination of air, water, milk; relation of bacteriology to the industries. LARSON, WARWICK, HENRICI.

59. SPECIAL BACTERIOLOGY. Study of pathogenic bacteria; bacteriological methods in clinical diagnosis; principles of infection and immunity, with practical application of serum reactions.

## [illegible] AND THERAPEUTICS

Professor THOMAS B. HARTZELL, HAROLD J. LEONARD.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Pathology and Therapeutics..... | 3 | Sr. | His. and Bac. |

1. PATHOLOGY AND THERAPEUTICS. Lectures and recitations involving general pathology as a foundation of the special pathology of the oral cavity; particular attention to therapeutic requirements of the mouth and teeth. Supplemented by laboratory work under the care of the chair of pathology, Department of Medicine. HARTZELL, LEONARD.

## PHARMACOLOGY

Professor ARTHUR R. HIRSCHFELDER; Associate Professor EDGAR D. BROWN; Assistant Professor ROBERT A. HALL.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | General Pharmacology | 2 | Jr. | Chem. 21, 22 |
| 2. | Experimental Pharmacology | 1 | Jr. | 1 |

2. GENERAL PHARMACOLOGY as applied to dentistry comprises a study of the properties, action, and therapeutic application of the principal drugs used in dentistry with exercises in prescription writing. HALL.

2. EXPERIMENTAL PHARMACOLOGY. Laboratory exercises affording the student the opportunity for observing the effects of the principal types of drugs upon the animal will be given to sections of the class in connection with Course 1. HIRSCHFELDER, BROWN, HALL.

## PHYSIOLOGY

Professor ELIAS P. LYON; Associate Professors RICHARD OLDING BEARD, FREDERICK H. SCOTT; Assistant Professors M. RUSSELL WILCOX, JOHN F. MCCLENDON; Instructors CHAUNCEY J. V. PETTIBONE, FRANCIS B. KINGSBURY; Assistants ROY E. CRUZEN, LYLE ROBERTS.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 4. | Physiologic Chemistry | 3 | Soph. | Chem. 21, 22 |
| 6. | Physiology | 4 | Soph. | An. Biol. and Chem. 21, 22 |

4. PHYSIOLOGIC CHEMISTRY. A course of lectures and laboratory studies of the compounds occurring in the animal body; of the food-stuffs; the digestion and of urinalysis. PETTIBONE, KINGSBURY, and Assistants.

6. PHYSIOLOGY. Lectures and laboratory exercises. The study of the general functional properties of tissue cells; of muscle-nerve functions; of blood, the circulation, respiration, digestion, secretion, and excretion. LYON, BEARD, SCOTT, MCCLENDON, and Assistants.

## PROSTHETIC DENTISTRY

Professor OSCAR A. WEISS; Associate Professors GEORGE M. DAMON, WILLIAM F. LASBY, HARRY C. LAWTON; Assistant Professors OSCAR COOPERMAN, CARL O. FLAGSTAD, CARL H. PETRI, CHARLES E. RUDOLPH; Instructors BERT C. ANDERSON, LEE A. HARKER, PAUL S. PARKER, ANDREW J. WEISS.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Prosthetic Technique | 4 | Fr. | None |
| 2. | Prosthetic Technique | 2 | Fr. | 1 |
| 3. | Prosthetic Technique | 3 | Soph. | 2 |
| 4. | Prosthetic Practice | 2 | Soph. | 3 |
| 5. | Prosthetic Practice | 2 | Jr. | 4 |
| 6. | Prosthetic Practice | 1 | Jr. | 5 |
| 7. | Prosthetic Practice | 1 | Sr. | 6 |
| 8. | Prosthetic Practice | 1 | Sr. | 7 |

1. PROSTHETIC TECHNIQUE. This course consists of lectures and technic work in the laboratory, comprising impression materials and their uses and the different processes of plate work. DAMON, COOPERMAN, FLAGSTAD, PETRI, RUDOLPH, HARKER, PARKER.

2. PROSTHETIC TECHNIQUE. Continuation of Course 1 as outlined above. DAMON, COOPERMAN, FLAGSTAD, PETRI, RUDOLPH, HARKER, PARKER.

3. PROSTHETIC TECHNIQUE. The course consists of lectures, recitations, and laboratory work covering the principles and practice of plate work. WEISS, LAWTON, ANDERSON, WEISS.

4. PROSTHETIC PRACTICE. A course of lectures, recitations, and clinical work covering the simpler forms of prosthetic practice. WEISS, LASBY, FLAGSTAD.

5. PROSTHETIC PRACTICE. A course of lectures, recitations, and clinical covering cleft palate and other special cases in addition to the general prosthetic practice. WEISS, LASBY, FLAGSTAD.

6. PROSTHETIC PRACTICE. Continuation of Course 5 as outlined above. WEISS, LASBY, FLAGSTAD.

7. PROSTHETIC PRACTICE. A course in general practice of prosthetics. WEISS, LASBY, FLAGSTAD.

8. PROSTHETIC PRACTICE. A continuation of Course 7 as outlined above. WEISS, LASBY, FLAGSTAD.

## RHETORIC AND PUBLIC SPEAKING

Professor JOSEPH M. THOMAS; Instructor CYRIL A. HERRICK.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 3. | Composition and Rhetoric | 3 | Fr. | None |
| 4. | Composition and Rhetoric | 3 | Fr. | None |

3. RHETORIC AND COMPOSITION. Training in writing; study of the work of writers who have handled scientific subjects with clearness and power; outside reading. HERRICK.

4. RHETORIC AND COMPOSITION. A continuation of Course 3. HERRICK.

## THEORY AND PRACTICE OF DENTISTRY

Professors ALFRED OWRE, BROR E. DAHLGREN, and Associates.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Theory and Practice of Dentistry.... | 2 | Sr. | None |

2. THEORY AND PRACTICE OF DENTISTRY. A lecture and conference course in the theory and practice of dentistry and applied Economics, Jurisprudence, Psychology, Ethics, and Art. OWRE, DAHLGREN, and Associates.

## ELECTIVES

The following subjects or substitute subjects may be taken as electives by students having a satisfactory standing and with the approval of the Student Work Committee:

Dental Electricity and Radiography
Ethics
Economics
Psychology
Special Bacteriology
Special Pathology
Special Pharmacology

# STUDENTS

## SENIORS

Behring, Walter E.
Benepe, Louis M., Jr.
Benson, Carl A. W.
Bratager, George C.
Burrington, Therlo E.
Bursell, Harry L.
Butler, George V.
Carlson, Arthur C.
Carroll, Ray T.
Cary, Milburn J.
Clay, Ray L.
Cohen, Joseph T.
Covey, Wilbur C.
Cowan, Vern L.
Crowell, Walter, Jr.
Cruttenden, Louis
Curry, Ray D.
Dahl, Casper
Danz, Paul E.
Darrington, Thomas M.
Delton, Rudolph W.
Dick, Shellie E.
Doyle, Elmer
Dunn, Patrick, M.
Eastman, Victor J.
Ellertson, Carl H.
Evjen, Einar
Ewert, William
Ford, William J.
Gardner, Herbert E.
Gies, Clarence S.
Glade, Thomas A.
Gottenborg, Archie C.
Haedge, Carl
Hansen, Elmer L.
Hayes, Fred H.
Hedin, Oscar E.
Hermann, Clarence
Hicks, Harvey R.
Holmgren, Helmer W.
Huderle, Arthur J.
Ingebrigtsen, Leonard
Johnson, Carl E.
Johnson, Oscar H.
Kennedy, Walter J.
Keyworth, Rolend G.
Kotrich, Joseph F.
Kraft, Max C.
Lacey, Glenn D.
Lang, Archie, Jr.
Larson, Chester D.
Larson, L. Leonard
Lehman, C. V.
Leighton, Emmet
Litin, Abe A.
Lossius, Sophus
Lundblad, Clarence H.
Love, Elwyn K.
Lussier, Norman A.
Manternach, Paul
Meyer, Erna M.
Meyer, Richard G.
Nelson, Earl W.
Olsen, Alfred
Olson, Halver C.
Oswald, Eldred
Parker. Lee E.
Peterson, Palmer L.
Price, Milton A.
Ralston, Elmer H.
Reed, Kenneth C.
Russell, Edwin C.
Ryan, Edward
Sandahl, Carl M.
Schopf, Henry J.
Schultz, Wm. E.
Simmons, John S.
Stewart, Roscoe E.
Etemper, Elmer
Stowe, Lewis Riddell
Sullivan, Emmet E.
Talbot, Harry G.
Taylor, William R.
Tibesar, Frank E.
Tràholt, Carl F. C.
Vroman, Clinton H.
Wahlquist, Harold
Webb, William L.
Zierke, Roland H.

## JUNIORS

Abell, Walter J.
Anderson, Leroy C.
Bergerson, Louis B.
Bergh, Ingvald G.
Birnberg, Jacob V.
Bodien, August T.
Borovsky, Abe
Brink, Frank T.
Bruss, Erwin F.
Buehler, John E.
Chisholm, David R.
Colburn, Daniel N.
Cohler, Michael J.
Connell, John E.
Cook, George W.
Danz, Beatrice
Dampier, Donald G.
Diamond, Hymen A.
Durfee, Laurence M.
Farrell, Stanley M.
Fee, Graham B.
Feeney, Howard S.
Fossum, Edgar A.
Freier, Ephraim F.
Gabrielson, Leonard C.
Geddes, Donald D.
Gerde, Magnue A.
Girvin, Cecil W.
Harper, Fred W.
Hansen, Arthur P.
Hartig, Rolf P.
Hartwig, Joseph I.
Haven, Walter K.
Healy, Clifford J.
Hendricks, Lambert M.
Herrmann, Max R.
Hillman, Harold C.
Hoglund, Herbert A.
Holliday, Houghton
Iverson, Walter G.
Johnson, Ray L.
Jernall, Roy M.
Just, Dagny
Kubesh, Edward J.
LeMay, Ray B.
Lillehei, Clarence I.
Lindelein, Clifford O.
Linquist, Robert W.
Lorhammer, Gustav A.
McCaffrey, William J.
McKenzie, Morell D.
Meintsma, Richard
Miller, Melvin A.
Neiman, Robert
Nelson, Clarence A.
Nylander, Victor T.
Paske, Charles H.
Peterson, Chester R.
Peterson, Walter F.
Pfeiffer, Roy H.
Pierson, Linus L.
Plonty, Eatl W.
Radke, L. Maurice
Radke, W. Lynn
Reinking, Henry N.
Reynolds, William D., Jr.
Ribbel, George H.
Ringstrom, George M.
Roelike, Stephen J.
Robinson, John F.
Saevig, Gerhard
Schuft, Adolph F.
Sell, Charles A.
Sahckell, Harold
Shanahan, Raymond
Simonson, August E.
Skon, Arthur E.
Stevens, Marion
Swanson, Clayton N.
Thorson, M. Hauman
Tucker, Charles M.
Tucker, Clarence A.
Von Bohland, Frederick
Watson, William E.
Wedin, Arthur C.
Weibeler, Christram
Weisman, Harry L.
Wendell, Lehman
West, Earl C.
Whitaker, Vernon D.
Whitney, William C.
White, Eleonora S.
White, Floyd M.
Wilson, Oliver P.
Wolter, Amadeus
Zettler, Walter W.
Ziskin, Daniel

## SOPHOMORES

Abrahams, Oscar H.
Albrecht, Arnold W.
Anderson, Ernest C.
Anderson, Gustave R.
Anderson, C. Oscar
Anderson, Raymond H.
Bang, Charles B.
Beckenstein, Isadore S.
Borosvky, Jacob L.
Brady, Grank P.
Brandenborg, George A.
Brooks, Fiske I.
Carey, Walter E.
Carlson, Melvin H.
Davis, Vernon J.
Dwire, George J.
Eklund, Conrad L.
Farmer, Ernest A.
Faus, Neil A.
Finnegan, Roscoe L.
Flandrich, Carl R.
Foster, Leslie W.
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Geldman, David I.
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Gullinbs, Ingeman O.
Hagberg, Warner V.
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Haugberg, Elmer T.
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Hoitomt, Raymond
Homme, August H.
How, Roy M.
Johnson, George A.
Johnson, Herbert E.
Johnson, Harvey
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Kirkpatrick, Frederick K.
Kirkpatrick, Virgil L.
Koppes, Albrecht J.
Krishef, Jacob L.
La Freniere, John G.
Lauer, Vernon G.
Lee, Cloyde W.
Lee, Ernest T.
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McGinn, J. A.
McKinny, Walter H.
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Ness, Hans B.
Nishioka, Maschito
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Thorson, H. A.
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Wellman, H. Walter
Werner, Conrad O.
Williams, Sigfred G.
Woodruff, Harold S.
Woods, Lorenz F.
Wrbitzky, Benjamin
Wrucke, Arthur L.
Zimmerman, Emanuel

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Anderson, Harry
Anderson, Lloyd C.
Aronson, Arthur Verne
Babcock, Willard L.
Bierman, Claude W.
Brandt, Henry R.
Bratrude, Earl J.
Britzius, Kenneth E.
Braun, Edward C.
Butler, George E.
Carpenter, Earl R.
Conway, James H.
Cook, Maynard E.
Daly, Timothy L.
Davidson, Fred V.
Dille, Walter O.
Doyle, Thomas C.
Dworsky, Peter A.
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Elliott, Virgil D.
Fink, Walter H.
Foster, James M.
Francis, Vinal B.
Frank, Joe H.
Gross, Louis
Gumper, Joseph W.
Hallum, Ferdinand
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Hansen, Dallas B.
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Johnson, Joseph A.
Julien, Antone W.
Jumer, Albert
Kline, Roman P.
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Kribs, David A.
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Larson, William J.
Levy, Mandel M.
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Love, Maclaren E.
Lynde, J. Kenneth
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Mara, Samuel G.
Meisser, John G.
Melby, Almer J.
Miszewski, Aurelius
Mohn, Elmer J.
Morcom, Harold E.
Mountian, Matthew D.
Murphy, Sylvester L.
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Myhr, Roy O.
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Paine, Ralph
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Reed, Reginald R.
Rodman, Duane E.
Rogstad, Otto V.
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# Bulletin of The University of Minnesota

# THE SCHOOL OF MINES

## 1916-1917

VOL. XIX. NO. 10 MAY 1916

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## 1916

### JULY

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## 1917

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### DECEMBER

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| **1916** | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees. |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School closes |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| **1917** | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |

| | | | |
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| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 7-14 | Week | Military Encampment, Fort Snelling |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fourth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

*Program of Supplementary Examinations*

| | | | |
|---|---|---|---|
| Tuesday, | Sept. 19 | 9-12 a.m. | Mechanics and Mathematics |
| | | 2-5 p.m. | Mining Engineering Subjects |
| Wednesday, | Sept. 20 | 9-12 a.m. | Chemistry |
| | | 2-5 p.m. | Drawing and Descriptive Geometry |
| | | 2-5 p.m. | Mechanical Engineering Subjects |
| Thursday, | Sept. 21 | 9-12 a.m. | Metallurgical Subjects |
| | | 2-5 p.m. | Physics |
| Friday, | Sept. 22 | 9-12 a.m. | Electrical Engineering Subjects |
| | | 2-5 p.m. | Geology and Mineralogy |

# THE SCHOOL OF MINES

## FACULTY

George Edgar Vincent, Ph.D., LL.D., President 1005 5th St. S. E.
Cyrus Northrop, LL.D., President Emeritus 519 10th Ave. S. E.
William R. Appleby, M.A., Dean and Professor of Metallurgy 928 5th St. S. E.
....., Professor of Mining
Oscar C. Burkhard, M.A., Assistant Professor of German 719 E. River Road
Peter Christianson, B.S., E.M., Professor of Metallurgy 217 Union St. S. E.
Elting H. Comstock, M.S., Professor of Mine Plant and Mechanics 1416 7th St. S. E.
William H. Emmons, Ph.D., Professor of Mineralogy and Geology 611 11th Ave. S. E.
Henry A. Erikson, Ph.D., Professor of Physics 424 Harvard St. S. E.
John J. Flather, Ph.B., M.M.E., Professor of Mechanical Engineering 315 11th Ave. S. E.
George B. Frankforter, Ph.D., Professor of Chemistry 525 E. River Road
Jules T. Frelin, B.A., Assistant Professor of Romance Languages 1206 5th St. S. E.
Frank F. Grout, M.S., Assistant Professor of Geology and Mineralogy 617 4th St. S. E.
Samuel L. Hoyt, E.M., Ph.D., Assistant Professor of Metallography 1011 14th Ave. S. E.
William H. Kavanaugh, M.E., Professor of Experimental Engineering 124 State St. S. E.
William H. Kirchner, B.S., Professor of Drawing and Descriptive Geometry 722 10th Ave. S. E.
Edwin M. Lambert, M.E., Assistant Professor of Mine Plant and Mechanics 1086 12th Ave. S. E.
Edward P. McCarty, E.M., Professor of Mining 3615 Lyndale Ave. S.
Franklin R. McMillan, C.E., Assistant Professor of Structural Engineering 524 8th Ave. S. E.
Everett W. Olmsted, Ph.D., Professor of Romance Languages 901 5th St. S. E.
Levi B. Pease, M.S., Professor of Metallurgy 1070 16th Ave. S. E.
William T. Ryan, E.E., Assistant Professor of Electrical Engineering 3228 4th St. S. E.
Carl Schlenker, B.A., Professor of German 514 11th Ave. S. E.
George D. Shepardson, M.A., M.E., D.Sc., Professor of Electrical Engineering 717 E. River Road

S. Carl Shipley, B.S., M.E., Assistant Professor of Machine Construction 1517 E. River Road
Charles F. Shoop, B.S., Assistant Professor of Experimental Engineering 811 Fulton St. S. E.
Charles F. Sidener, B.S., Professor of Chemistry 1320 5th St. S. E.
Clinton R. Stauffer, Professor of Geology 1023 University Ave. S. E.
Anthony Zeleny, Ph.D., Professor of Physics 613 Fulton St. S. E.
Charles H. Blitman, C.E., Instructor in Drawing 1318 7th St. S. E.
Edward W. Davis, B.S., Instructor in Mechanics and Mathematics 979 14th Ave. S. E.
E. O. Dieterich, Ph.D., Instructor in Physics 809 Essex St. S. E.
Gerhard Dietrichson, Ph.D., Instructor in Chemistry 429 Walnut St. S. E.
Robert W. French, B.S., Instructor in Drawing 1018 16th Ave. S. E.
J. Theodore Geissendoerfer, Ph.D., Instructor in German 967 14th Ave. S. E.
A. Walfred Johnston, M.A., Instructor in Geology 803 University Ave. S. E.
Ervin W. McCullough, E.M., Instructor in Metallurgy 934 E. Bayliss Ave., St. Paul
John F. Murphy, C.E., Instructor in Mining 619 University Ave. S. E.
Edmund Newton, E.M., Instructor in Metallurgy 941 14th Ave. S. E.
Edward P. Quigley, Instructor in Forge Work 2923 Chicago Ave.
Terence T. Quirk, E.M., Ph.D., Instructor in Geology 1603 4th St. S. E.
William H. Richards, Instructor in Carpentry 1423 W. 27th St.
Frank B. Rowley, B.S., M.E., Instructor in Drawing 217 Beacon St. S. E.
Edward H. Sirich, Instructor in Romance Languages 321 14th Ave. S. E.
Woldemar M. Sternberg, B.S.Chem., Instructor in Chemistry 3345 University Ave. S. E.
Sterling Temple, M.A., Instructor in Chemistry 1758 Blair St., St. Paul
Richard Wischkaemper, M.A., Instructor in German 979 14th Ave. S. E.
Arnold Kirkpatrick, Ph.B., Assistant in Chemistry 1703 Taylor Ave., St. Paul
Thomas M. Broderick, Assistant in Geology 3204 Portland Ave.
William L. Uglow, Ph.D., Assistant in Geology 1609 4th St. S. E.

# GENERAL INFORMATION

The School of Mines was established by the Board of Regents in 1888, upon recommendation of the General Faculty of the University. The buildings and laboratories of the School are located on the main campus of the University. The mining districts of Minnesota are within a few hours, by rail, from Minneapolis. The heartiest coöperation exists between the various mine managements and the School, so that the mining properties are at all times open to parties from the school for observation and study trips. Practical surveying, geological field work, and underground work are carried on in one or more of the districts. Students in the School of Mines have, therefore, all the advantages afforded by a large university combined with ample opportunity for field observation and experience.

The School of Mines occupies the new building provided by the Legislature of 1913. In the basement are the assay and electro-metallurgical laboratories, together with machinery room, instrument room, balance room, furnace rooms, and necessary storerooms. On the first floor are the administrative offices, offices and lecture rooms of the departments of Metallurgy and Mine Plant and Mechanics. On the second floor are the offices, lecture rooms and drafting rooms of the department of Mining, the ore dressing laboratory, and the library of the school. On the third floor are the offices, laboratories, and lecture rooms of the department of Metallography, junior drafting room, photographic dark rooms, blue printing room, and offices and computing rooms for the branch of the Experiment Station serving the Tax Commission.

## DEGREES

In the School of Mines there are three regular courses of study, viz., Mining Engineering, Mining Engineering specializing in Geology, and Metallurgy, leading to the degree of Engineer of Mines (E.M.), Engineer of Mines in Geology [E.M. (Geology)], and Metallurgical Engineer (Met.E.) respectively.

The degree of Metallurgical Engineer may be conferred upon a candidate who received the degree of Engineer of Mines in four or five years, and vice versa, provided such candidate completes an additional year's work at the School and presents a suitable thesis.

Students in the College of Science, Literature, and the Arts, in the College of Engineering and the Mechanic Arts, and in the School of Analytical and Applied Chemistry, who contemplate taking a degree in this School after completing their course, are recommended to select their electives with reference to as full a preparation as possible for the technical work of the course they propose to enter.

## CLASSIFICATION OF SUBJECTS

The work falls under the following subdivisions, supplemented by thoro courses in mechanics, mathematics, surveying, physics, chemistry, and the necessary theory and practice of structural, mechanical and electrical engineering.

(a) *Geology*—to determine the location of the ore. (b) *Mineralogy*—to determine its nature. (c) *Assaying*—to determine if it has value for treatment. (d) *Mining Engineering*—to furnish material for treatment. (e) *Ore Testing*—to determine best methods of treatment. (f) *Ore Dressing*—furnishing products for metallurgical treatment. (g) *Metallurgy*—smelting and refining ores and ore dressing products; reduction to metals.

## EXPERIMENT STATION

The School of Mines Experiment Station has been recently established to promote the development of the mining and mineral resources of the state, to assay specimens of ores, rocks, clays, and minerals; to make such assays free of charge for private parties subject to such regulations as the Board of Regents may deem necessary; to make mining and metallurgical experiments in the treatment of such substances and in the utilization of mining and metallurgical by-products; to investigate methods of mining and the use of explosives; to undertake such other mining and metallurgical problems as may seem desirable; to make all ore estimates for the Tax Commission and to do such other work along the lines above outlined as may be requested by other state departments. Coöperation has been effected with the Minnesota Geological Survey and the School of Chemistry.

The Experiment Station is prepared to assist citizens interested in these lines of work; to assay specimens of ore, rocks, clays, and minerals found within the state free of charge.

In submitting samples the sender must state the exact location where each sample was found, giving all possible additional information. This information, together with results of any test or analysis, will be on file and available to the public at the office of the Station. Citizens desiring free assay privileges must agree to give accredited representatives of the School of Mines Experiment Station and of the Geological Survey access to the property should they desire to visit the same for purposes of examination and geological study.

Correspondence will receive prompt attention, but consultations generally prove more satisfactory.

Each sample should be numbered for identification and bear the name and address of the sender. All shipments must be delivered to the Minnesota School of Mines, charges prepaid. Shipping tags will be furnished upon request.

Address all communications to William R. Appleby, Director, Minnesota School of Mines Experiment Station, The University of Minnesota, Minneapolis, Minnesota.

## LIBRARY

The library occupies a well-lighted room, 55 feet by 61 feet, on the second floor of the School of Mines building. The books have been carefully selected and form a working collection of great value, not only to the faculty and students, but also the mining men of the state. Only books relating to mining, metallurgy, metallography, geology and allied subjects are shelved in this library, the general university library as well as the public libraries of Minneapolis and St. Paul serving as reserve collections. The library is especially rich in complete sets of periodicals, transactions, and the reports of state and foreign mining departments. Foreign technical literature is well represented. A card index is kept of all articles of value and interest appearing in the leading periodicals.

## ADMISSION

The courses leading to the degrees of Engineer of Mines, Engineer of Mines (in Geology) and Metallurgical Engineer may be completed in either four or five years. Students may enter the School of Mines without preparation in Higher Algebra and Solid Geometry. Such students must enter the five-year courses. It is recommended that students who come poorly prepared in Mathematics enter the five-year courses.

Students may be admitted to the School of Mines either by certificate or examination, or both.

### ADMISSION BY EXAMINATION

Entrance examinations are offered at the University during registration week, September 19 to 22. Candidates entering by this method must pass examinations in fifteen units so chosen as to satisfy the requirements outlined below. Certificates from the College Entrance Examination Board and from the High School Board are accepted in lieu of examinations in the subjects they represent. Those desiring to take examinations should notify the Registrar of the University in writing not later than August 31.

### ADMISSION BY CERTIFICATE

Graduates of the following courses, provided their preparation satisfies the requirements outlined below, may be admitted.

1. Any four-year course of a Minnesota state high school or other accredited school in the state.
2. A four-year course of schools in any other state accredited to the state university of that state.
3. The Advanced Latin and Advanced English courses of the Minnesota state normal schools.

The applicant for admission should request the principal or superintendent to forward to the Registrar of the University a complete tran-

script of his high-school or preparatory-school record showing the number of weeks and hours per week spent upon each study, with the grades entered as *passed, passed with credit,* or *passed with honor.* Credential blanks prepared by the University must be used; these blanks may be secured upon application to the Registrar. Upon receipt of the credentials at the University the Registrar will notify the applicant with regard to his admission.

## ENTRANCE REQUIREMENTS

### FIVE-YEAR COURSES

English, three units; Elementary Algebra and Plane Geometry, one unit each; ten additional units, of which not more than four may be in Group F.

### FOUR-YEAR COURSES

Same as five-year courses with the addition of one-half unit each of Higher Algebra and Solid Geometry. It is recommended that students who enter these courses review Higher Algebra and Solid Geometry. Those unable to carry freshman mathematics satisfactorily will be required to re-register in the five-year course.

### LIST OF ENTRANCE SUBJECTS

The term *unit* means not less than five recitations of forty minutes each per week for a period of thirty-six weeks. In manual subjects and kindred courses, it means the equivalent of ten recitation periods per week for thirty-six weeks.

GROUP A. ENGLISH. Four units.

GROUP B. LANGUAGES. Latin, Greek, German, French, Spanish, Scandinavian, one to four units each.

GROUP C. HISTORY AND SOCIAL SCIENCES. Ancient and Modern History, one unit each; English and Senior American History, one-half unit each; American Government, Economics, Economic History of England, and Economic History of the United States, one-half unit each; Commercial Geography, and History of Commerce, one-half or one unit each.

GROUP D. MATHEMATICS. Elementary Algebra and Plane Geometry, one unit each; Higher Algebra, Solid Geometry, and Trigonometry, one-half unit each.

GROUP E. NATURAL SCIENCES. Physics and Chemistry, one unit each; Botany and Zoology, one-half or one unit each; Physiology, Astronomy, Geology, and Physiography, one-half unit each.

GROUP F. VOCATIONAL SUBJECTS. Business Law and Business Arithmetic, one-half unit each; Elementary and Advanced Bookkeeping, one

unit each; Stenography and Typewriting, one or two units. Freehand Drawing, Mechanical Drawing, and Shopwork, one or two units each. Agriculture, one to four units. Normal Training subjects, one to three units, provided the applicant has had one year of subsequent teaching experience.

## DESCRIPTION OF SUBJECTS ACCEPTED FOR ADMISSION

A description of the subjects accepted for admission to the University will be found in the Bulletin of General Information, which will be sent to any address upon application to the Registrar, The University of Minnesota, Minneapolis.

## UNCLASSED STUDENTS

No unclassed students will be admitted to the School of Mines.

## ADMISSION TO ADVANCED STANDING

This University accepts records from all reputable colleges and universities for credit to advanced standing. Such records are accepted as far as they are equivalent to the work done in this institution. In bringing records from other institutions, the certificate must be upon the official blank of the institution granting the certificate and should show:

(a) The subject studied; if a language, the books read, etc.
(b) The number of weeks and hours per week spent upon each subject.
(c) Ground covered in laboratory work in case of laboratory subjects.
(d) The result. The exact grades should be stated, accompanied by an explanation of the marking system employed.

Students who desire to obtain advanced standing must present their applications and certificates to the departments concerned, obtain a written statement from the department, showing the exact credit allowed, and present this to the Enrollment Committee of the School of Mines.

## EXPENSES

One half of the Annual Incidental Fee of $55, which includes all laboratory charges, is payable at the opening of each semester. Cards entitling the student to admission to classes will not be issued until the fees have been paid. Books and supplies for each year of the course cost approximately $25. Field-work expense during the sophomore year is estimated at $150 and for the junior year at $225.

### DEPOSIT FEE

At the beginning of each year, in addition to the first semester incidental fee, a deposit fee of five dollars is required of every student to cover the following items:

Change of Registration..... $2.50
Examination for removal of condition at set time...$1.00 per subject
Rental of post-office box, University post-office (required of all)..... $.50 per year
Locker rental, locker key deposit.....$.50 to $1.00 per year
Laboratory breakages, or damage to University property.
Penalties for late registration or late payment of fees.

A penalty fee of one dollar ($1) must be paid by all students who register or pay fees after the prescribed time. (See calendar, page 3.) After the day previous to that on which classes begin, the penalty for delay increases at the rate of twenty-five cents a day.

The unused balance of the deposit fee will be returned at the end of each year. If, at any time during the college year, the amount of charges against a student exceed the amount of the deposit, a second fee of five dollars ($5) will be required.

### SPECIAL FEES

The following special items may be included in the expenses of a student:

Minnesota Union membership, required.....$1 per semester
Special examination for removal of condition, at other than the set time ..... 5.00
Examination on subject taken out of class..... 5.00
No fee for such examinations on first entering the University, if taken within the first six weeks.
Military uniform, required of all freshmen and first-year students .....15.00
Gymnasium suit ..... 5.00

## THE ELLIOT SCHOLARSHIP LOAN FUND

To fulfill the wish of the late Dr. A. F. Elliot to aid young men who find their efforts to obtain a practical education embarrassed through lack of means, the sum of $5,000 was placed in the hands of the Board of Regents as a scholarship fund. The income from this fund is loaned students in the School of Mines on the following conditions: the financial needs of the applicant, his scholarship, moral character, enthusiasm shown in his work, and promise of usefulness in his profession. When money is available, it may be loaned to pay the expenses of worthy students during sickness. The loans are to be repaid, without interest, at the earliest convenience of the recipients.

## GRADUATION

Students completing courses of study to the satisfaction of the Faculty are entitled to receive the appropriate degrees. Any person may undergo, at suitable times, examinations in any subject. If such person pass in

all the studies and exercises of a course, he is entitled to the appropriate degree, provided that at least one full year be spent at the University before such degree shall be granted, and provided the examination in every case be held before a committee of the Faculty appointed for that purpose.

Seniors must be in regular attendance at all classes until after the final examinations held at the end of the second semester. Irregular attendance will debar a student from entering all final examinations.

## THESIS

The thesis work is intended to bring in review and connect the work in Mining and Metallurgy, Geology and Mineralogy, Mechanical and Electrical Engineering, Mathematics and Mechanics.

It has been found that this purpose is most satisfactorily accomplished by assigning to each student a project, embracing the prospecting, development, and equipment of a group of mining claims, for candidates for the degree of Engineer of Mines; the investigation of a problem in mining geology, for candidates for the degree of Engineer of Mines (in Geology); and the investigation of a metallurgical problem, for candidates for the degree of Metallurgical Engineer.

As much latitude as possible will be allowed the student in the choice of type of deposit and location. He must select a suitable project during the summer preceding the senior year. Outlines are furnished setting forth the lines of investigation necessary to obtain the required data. The junior field work affords ample opportunity therefor.

Prior to the reopening of Field Work at the School of Mines, Tuesday, September 19, 1916, each student is required to submit to the department concerned an outline embodying the principal features of the project, together with a topographic map and a sufficient number of photographs to represent clearly the locality. Unless this outline is submitted when due and is accepted by the department, final registration for the first semester, senior year, will not be permitted.

Students may, if they so desire, take a reasonable number of samples on which to make assays and hand laboratory tests during the ore-testing laboratory work given in the first semester, senior year.

All preliminary work must be done and final work on the project must be under way by December 1. On April 7 the text of the thesis must be completed and submitted for final approval. Completed work (typewritten and bound) together with all tracings and one set of clear blue prints therefrom must be in and accepted not later than April 30. Theses will not be accepted or examined after these dates. Unless the above conditions are complied with no student can expect to graduate with his class.

These theses shall become the property of the School.

## SPECIAL NOTES

Students failing to receive a semester mark of 75 per cent in any subject shall have the privilege of a supplementary examination before the opening of the following year.

Each student must obtain from the Registrar his average in all subjects and present himself for supplementary examinations, according to the program given on page 4.

Failure of the Registrar to notify a student of deficiencies will not be accepted as a reason for neglecting to report for necessary supplementary examinations. Students failing to report for supplementary examinations will be compelled to take work over in class as in case of failures.

Students failing to pass supplementary examinations will become members of the succeeding class and must register for those subjects in which they have failed They may take in addition other subjects not more than one year in advance of their class, with the exception of mining and metallurgical courses, based upon requirements of the various courses and daily program. They may also take certain electives in other colleges provided suitable arrangements can be made.

Students failing to receive a semester mark of 50 per cent in any subject shall not be allowed to pursue any dependent subject.

The Faculty may exclude students from attending classes in any subject upon recommendation of the department concerned.

All students must report in time to make suitable arrangements with departments concerned in case of conflicts in program.

Students failing to present themselves for final examination at the end of the first or second semester will be given zero on the examinations.

Students whose absences in either semester exceed four weeks in the aggregate are not permitted to take examinations without special permission of the Faculty.

All subjects elected in other colleges become part of the School of Mines curriculum. All students are required to receive credits in these subjects before graduation.

During the academic year students will be held responsible for the receipt of official communications sent to them through the University post-office. During the summer vacation they will be held responsible for the receipt of such communications sent to the home address given on registration blank for the preceding academic year, unless forma notification of their correct address is filed with the Registrar and the Dean.

# COURSES OF STUDY

## UNIFORM CURRICULUM TO END OF SOPHOMORE YEAR

The courses leading to the degrees of Engineer of Mines, Engineer of Mines in Geology, and Metallurgical Engineer, are uniform for the first three years of the five-year courses and for the first two years of the four-year courses.

### Five-Year Courses

#### FIRST YEAR

*First Semester*

Chemistry 5*, General and Analytical, 5†
Mathematics 1, Computation and Mensuration, 4
Mathematics 3, Mine Accounting, 6
Mechanical Engineering 1, Shop Work, 6
Mineralogy 23, Elements of Mineralogy, 8
Military Drill

*Second Semester*

Chemistry 6, General and Analytical 7, Chem. 5
Mathematics 2, Algebra, 4
Mechanical Engineering 1, Shop Work, 6
Metallurgy 2, Assaying, 12, Chem. 5, Mineral. 23
Mineralogy 24, Descriptive Mineralogy, 4, Mineral. 23
Military Drill

#### FRESHMAN YEAR

*First Semester*

Chemistry 11, Quantitative Analysis, 7, Chem. 5, 6
Drawing 11, Engineering Drawing, 10
Geology 105, Elements of Rock Study, 4, Mineral. 24
Mathematics 5, Algebra and Trigonometry, 6, Math. 1, 2
Metallurgy 3, General and Iron, 3, Chem. 6, Met. 2
Military Drill

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*Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. In the case of courses repeated the second semester, the suffix *a* indicates first semester; the suffix *b*, second semester.

†Figure following the descriptive name of a course indicates number of hours a week. Course names following indicate prerequisite courses.

*Second Semester*

Chemistry 12, Quantitative Analysis, 7, Chem. 11
Drawing 12, Engineering Drawing, 8, Draw. 11
Mathematics 6, Trigonometry and Analytical Geometry, 6, Math. 5
Geology 1b, General Geology, 3, Mineral. 24
Geology 106, Petrology, 4, Geol. 105
Metallurgy 4, Wrought Iron and Steel, 3, Met. 3
Military Drill

SOPHOMORE YEAR

*First Semester*

Drawing 13, Descriptive Geometry, 2, Draw. 12, Math. 6
Mathematics 7, Calculus, 5, Math. 6
Geology 73, Historical and Economic Geology, 3, Geol. 106
Metallurgy 105, Base Metals, 4, Met. 4
Mining 1, Mine Surveying, 3, Math. 6
Physics 1, General, 3, Math. 6
Physics 3, General Laboratory Practice, 2, with Physics 1

*Second Semester*

Drawing 14, Drafting, 4, Draw. 13
Mathematics 8, Calculus, 3, Math. 7
Metallurgy 106, Precious Metals, 4, Met. 105
Mining 2, Mine Surveying, 3, Min. 1
Mining 6, 1
Physics 2, General, 3, Physics 1
Physics 4, General Laboratory Practice, 2, with Physics 2
Field Work. Months of May, June, July and August
Mining 2f, Surveying, Min. 2, beginning about May 1
Geology 1f, Geol. 1b, 105, beginning about June 15
Underground Mining Work, beginning about July 1

## Four-Year Courses

FRESHMAN YEAR

*First Semester*

Chemistry 5, General and Analytical, 5
Drawing 11, Engineering Drawing, 10
Mathematics 5, Algebra and Trigonometry, 6
Mineralogy 23, Elements of Mineralogy, 8
Military Drill

*Second Semester*

Chemistry 6, General and Analytical, 7, Chem. 5
Drawing 12, Engineering Drawing, 8, Draw. 11
Mathematics 6, Trigonometry and Analytical Geometry, 6, Math. 5
Metallurgy 2, Assaying, 12, Chem. 5, Mineral. 23
Mineralogy 24, Descriptive Mineralogy, 4, Mineral. 23
Military Drill

SOPHOMORE YEAR

*First Semester*

Chemistry 11, Quantitative Analysis, 7, Chem. 5, 6
Drawing 13, Descriptive Geometry, 2, Draw. 12, Math. 6
Geology 105, Elements of Rock Study, 4, Mineral. 24
Mathematics 7, Calculus, 5, Math. 6
Metallurgy 3, General and Iron, 3, Chem. 6, Met. 2
Mining 1, Mine Surveying, 3, Math. 6
Physics 1, General, 3, Math. 6
Physics 3, General Laboratory Practice, 2, with Physics 1
Military Drill

*Second Semester*

Chemistry 12, Quantitative Analysis, 7, Chem. 101
Drawing 14, Drafting, 4, Draw. 13
Geology 1b, General Geology, 3, Mineral. 24
Geology 106, Petrology, 4, Geol. 105
Mathematics 8, Calculus, 3, Math. 7
Metallurgy 4, Wrought Iron and Steel, 3, Met. 3
Mining 2, Mine Surveying, 3, Min. 1
Mining 6, 1
Physics 2, General, 3, Physics 1
Physics 4, General Laboratory Practice, 2, with Physics 2
Military Drill
Field Work. Months of May, June, July and August
Mining 2f, Surveying, Min. 2, beginning about May 1
Geology 1f, Geol. 1b, 105, beginning about June 15
Underground Mining Work, beginning about July 1

# COURSES IN MINING ENGINEERING

## COURSES LEADING TO THE DEGREE OF E.M.

### Five-Year Courses

#### JUNIOR YEAR

*First Semester*

Chemistry 25, Ore and Slag Analysis, 7, Chem. 12
Experimental Engineering 21, Steam Laboratory, 4, with Mech. 11
Geology 111, Ore Deposits, 4, Geol. 106
Mechanics 9, 5, Math. 8
Mechanics 11, Mine Plant, 5, Math. 8
Metallurgy 5, Ore Dressing, 4
Mining 9, 5, Min. 6

*Second Semester*

Experimental Engineering 22, Strength of Materials, 4, with Mech. 10
Geology 112, Problems in Ore Deposits, 4, Geol. 111
Mechanics 10, 6, Mech. 9
Mechanics 12, Mine Plant, 6, Mech. 11
Metallurgy 6, Ore Dressing 4, Met. 5
Mining 10, 5, Min. 9
Mining 4, Mine Mapping, 6, Min. 2f
Field Work. Months of May, June, July, and August
    Metallurgy 6f, beginning about May 1
    Mining 10f, beginning about May 15
    Underground Mining Work, beginning about June 1

#### SENIOR YEAR

*First Semester*

Electrical Engineering 53, Electric Power, 5, Physics, 3, 4
Mechanics 13, Water Power, 5, Mech. 10
Mechanics 15, Engineering Construction, 5, Mech. 10
Metallurgy 7, Ore Testing, 10, Met. 106, Min. 8
Mining 11, 5, Min. 10
Mining 13, Thesis, 2, Min. 10f

*Second Semester*

Experimental Engineering 24, Experimental Laboratory, 4, Exp. Eng. 21
Mechanics 16, Mine Plant Design, 10, Mech. 15
Metallurgy 8, Special Problems, 4, Met. 7
Mining 12, 5, Min. 11
Mining 14, Thesis, 12, Min. 13

## Four-Year Courses

### JUNIOR YEAR

*First Semester*

Experimental Engineering 21, Steam Laboratory, 4, with Mech. 11
Geology 73, Historical and Economic Geology, 3, Geol. 106, 1b
Mechanics 9, 5, Math. 8
Mechanics 11, Mine Plant, 5, Math. 8
Metallurgy 105, Base Metals, 4, Met. 4
Metallurgy 5, Ore Dressing, 4
Mining 9, 5, Min. 6

*Second Semester*

Experimental Engineering 22, Strength of Materials, 4, with Mech. 10
Mechanics 10, 6, Mech. 9
Mechanics 12, Mine Plant, 6, Mech. 11
Metallurgy 6, Ore Dressing 5, Met. 5
Metallurgy 106, Precious Metals, 4, Met. 105
Mining 10, 5, Min. 9
Mining 4, Mine Mapping, 6, Min. 2f
Field Work. Months of May, June, July, and August
    Metallurgy 6f, beginning about May 1
    Mining 10f, beginning about May 15
    Underground Mining Work, beginning about June 1

### SENIOR YEAR

*First Semester*

Chemistry 25, Ore and Slag Analysis, 7, Chem. 12
Electrical Engineering 53, Electric Power, 5, Physics 3, 4
Geology 111, Ore Deposits, 4, Geol. 106
Mechanics 13, Water Power, 5, Mech. 10
Mechanics 15, Engineering Construction, 5, Mech. 10
Metallurgy 7, Ore Testing, 10, Met. 106, Min. 8
Mining 11, 5, Min. 10
Mining 13, Thesis, 2, Min. 10f

*Second Semester*

Experimental Engineering 24, Experimental Laboratory, 4, Exp. Eng. 21
Geology 112, Problems in Ore Deposits, 4, Geol. 111
Metallurgy 8, Special Problems, 4, Met. 7
Mechanics 16, Mine Plant Design, 10, Mech. 15
Mining 12, 5, Min. 11
Mining 14, Thesis, 12, Min. 13

## COURSES LEADING TO THE DEGREE OF E.M. (GEOLOGY)

### JUNIOR YEAR

*First Semester*

Geology 73, Historical and Economic Geology 3, 106, 1b
Geology 11, Paleontology 3, 1b
German 15 or 17, 3, German 16 for 17
or
French 1 or 3, 3, French 2 for 3
Metallurgy 155, Metallography 4
Mining 9, 5, Min. 6
Elective 6 to 10

*Second Semester*

Geology 124, Structural and Metamorphic Geology 3, 73
Geology 12, Paleontology 3, 57
German 16 or 18, 3 German 15 or 17
or
French 2 or 4, 3, French 1 or 3
Metallurgy 156, Metallography 4, 155
Mining 10, 5, Min. 9
Mining 4, Mine Mapping 6, Min. 2f
Elective 3
Field work to be arranged

### SENIOR YEAR

*First Semester*

Geology 111, Ore Deposits 4, 73
Geology 151, Advanced General Geology, 3
Geology 113, Laboratory course in Economic Geology, 4, with 111
German 17 or 23, 3, German 16 or 18
or
French 3 or 5, 3, French 2 or 4
Mining 11, 5, Min. 10
Thesis, 2
Elective 3

*Second Semester*

Geology 112, Problems in Ore Deposits 4, Geol. 111
Geology 152, Advanced General Geology, 3
Geology 144, Construction and Interpretation of Geologic Maps, 3, Geol. 111
Geology 138, Testing of Economic Minerals, 3
German 18 or 24, 3, German 17 or 23
or
French 4 or 6, 3, French 3 or 5
Mining 12, 5, Min. 11
Thesis, 4

## DEPARTMENT OF MINING ENGINEERING

The department is well supplied with samples of the smaller mine equipment, models, drawings, photographs, lantern slides, and mine maps. The lectures treat of prospecting, development, support of excavations, mining methods, mine administration, mining law, and the necessary allied subjects. The courses in Mining Engineering extend through the sophomore, junior, and senior years.

### MINE SURVEYING

The work in surveying is given in the sophomore year and is designed solely for mining engineers. The work begins with the elements of plane surveying, with special reference to the computations necessary, followed by the higher theoretical work in plane surveying and its application to the problems met in underground surveying. Beginning with the first Monday in May, the class devotes seven weeks to field work at some convenient point on the Mesabi or Vermilion Range. The exact location will be announced in March of each year.

The students will be divided into squads of two to four. Each squad must provide itself with a 6-foot steel tape graduated to hundredths. The duration of the course will be seven weeks (5½ days of 8 hours each constitute a week). Each student will be required to complete satisfactorily the following exercises and surveys:

1. Chaining and taping
2. Compass work
3. Adjustment and use of wye and dumpy levels
4. Adjustment of mining transit
5. Reading angles
6. Traverse with transit and steel tape
7. Azimuth traverse with stadia
8. Determination of meridian, latitude, and time by solar and stellar observations
9. Survey of mining claim according to the regulations of the U. S. Government
10. Measurement of earthwork
11. Laying out railroad tangents, curves, and crossings
12. Exercises in plane table work and geological surveying
13. The survey of a mine

A full equipment of surveying instruments of the latest and best makes is furnished to each squad for this work.

This is followed by a course in Mine Mapping during the second semester of junior year.

Students who furnish satisfactory evidence of proficiency in this work may be given credit therefor. The department, however, reserves the right in any case to require such students to take a theoretical or a practical examination or both.

## FIELD WORK IN MINING

### *Sophomore Year*

After the close of the field work in Geology (last two weeks in June), members of the sophomore class are required to engage for six weeks in underground mining work on the Minnesota or Michigan iron ranges, for which they may receive wages.

### *Junior Year*

Upon termination of the junior field work in Metallurgy (about May 15), the members of the junior class, who are candidates for the degree of Engineer of Mines, are required to devote two weeks to the study of mine plant and mine operation under the direction of the department. This work will be given in one of the leading western metal mining districts, exact location to be announced in April of each year. Thereafter, during the months of June, July, and August, the student is required to spend at least six weeks in actual underground mining work in the West, for which he may receive wages. The department will render all possible assistance in locating students in districts of their choice. Each student must keep a diary and record therein, in minute detail, all observations and sketches. He must in person submit this diary to the department on the date of the reopening of field work. In judging the character of the student's field work, equal importance will be attached to the completed report and to the original field notes. The department reserves the right to reject note-books considered below the standard that should be demanded of candidates for senior work.

Field work will reopen at the School of Mines, Tuesday, September 19, 1916. No senior will be registered after that date. Registration will cover Field Work, Electric Power, and Geology.

The final reports covering Field Work in Mining and Metallurgy must be prepared at the School of Mines under the direct supervision of the departments concerned: Metallurgy, September 19-26, inclusive; Mining and Mine Plant, September 27–October 9.

On October 9 all seniors who expect to graduate must register for the remaining subjects. Prior to this date the student must submit a typewritten report on field work fully illustrated with drawings, to scale, made from the field sketches, covering metallurgical and milling operations, and details of plant and equipment. Final registration will not be allowed until after reports on field work are accepted. All final reports, therefore, must be presented on or before October 9. These reports shall become the property of the School.

The completion of sophomore and junior field work is a requisite for graduation, and satisfactory evidence thereof must be submitted to the department. Should a student, for sufficient reasons, fail to complete this work in regular course, he may, with the consent of the department, be permitted to pursue his regular studies. In all such cases, however, the degree will be withheld until all field work is completed.

# COURSES IN METALLURGY

## COURSES LEADING TO THE DEGREE OF MET. E.

### Five-Year Courses

#### JUNIOR YEAR

*First Semester*

Chemistry 25, Ore and Slag Analysis, 7, Chem. 12
Experimental Engineering 21, Steam Laboratory, 4, with Mech. 11
Geology 111, Ore Deposits, 4, Geol. 106
Mechanics 9, 5, Math. 8
Mechanics 11, Mine Plant, 5, Math. 8
Metallurgy 5, Ore Dressing, 4
Mining 9, 5, Min. 6

*Second Semester*

Experimental Engineering 22, Strength of Materials, 4, with Mech. 10
Geology 112, Problems in Ore Deposits, 4, Geol. 111
Mechanics 10, 6, Mech. 9
Mechanics 12, Mine Plant, 6, Mech. 11
Metallurgy 6, Ore Dressing 4, Met. 5
Mining 10, 5, Min. 9
Mining 4, Mine Mapping, 6, Min. 2f
Field Work. Months of May, June, July and August
    Metallurgy 6f, beginning about May 1
    Mining 10f, beginning about May 15
    Underground Mining Work, beginning about June 1

#### SENIOR YEAR

*First Semester*

Electrical Engineering 53, Electric Power, 5, Physics 3, 4
Mechanics 13, Water Power, 5, Mech. 10
Mechanics 15, Engineering Construction, 5, Mech. 10
Metallurgy 7, Ore Testing, 10, Met. 106, Min. 8
Metallurgy 11, Special Problems, 8, Met. 106, Min. 8
Metallurgy 109, Electrometallurgy, 3, Met. 106

*Second Semester*

Chemistry 144, Electrochemistry, 5, Chem. 102
Chemistry 24, Iron and Steel Analysis, 7, Chem. 12
Experimental Engineering 24, Experimental Laboratory, 4, Exp. Eng. 21
Mechanics 18, Mill and Smelter Design, 10, Mech. 15
Metallurgy 152, Metallography, 6, Met. 106
Metallurgy 8, Special Problems, 4, Met. 7
Metallurgy 14, Thesis, 10, Met. 11

## Four-Year Courses

### JUNIOR YEAR

*First Semester*

Experimental Engineering 21, Steam Laboratory, 4, with Mech. 11
Geology 73, Historical and Economic Geology, 3, Geol. 105, 1b
Mechanics 9, 5, Math. 8
Mechanics 11, Mine Plant, 5, Math. 8
Metallurgy 105, Base Metals, 4, Met. 4
Metallurgy 5, Ore Dressing, 4
Mining 9, 5, Min. 6

*Second Semester*

Experimental Engineering 22, Strength of Materials, 4, with Mech. 10
Mechanics 10, 6, Mech. 9
Mechanics 12, Mine Plant, 6, Mech. 11
Metallurgy 5, Ore Dressing 4, Met. 5
Metallurgy 106, Precious Metals, 4, Met. 105
Mining 10, 5, Min. 9
Mining 4, Mine Mapping, 6, Min. 2f
Field Work. Months of May, June, July, and August
    Metallurgy 6f, beginning about May 1
    Mining 10f, beginning about May 15
    Smelter Work, beginning about June 1

### SENIOR YEAR

*First Semester*

Chemistry 25, Ore and Slag Analysis, 7, Chem. 12
Electrical Engineering 53, Electric Power, 5, Physics 3, 4
Mechanics 13, Water Power, 5, Mech. 10
Mechanics 15, Engineering Construction, 5, Mech. 10
Metallurgy 7, Ore Testing, 10, Met. 106, Min. 8
Metallurgy 11, Special Problems, 8, Met. 106, Min. 8
Metallurgy 109, Electrometallurgy, 3, Met. 106

*Second Semester*

Chemistry 144, Electrochemistry, 5, Chem. 102
Chemistry 24, Iron and Steel Analysis, 7, Chem. 12
Experimental Engineering 24, Experimental Laboratory, 4, Exp. Eng. 21
Mechanics 18, Mill and Smelter Design, 10, Mech. 15
Metallurgy 152, Metallography, 6, Met. 106
Metallurgy 8, Special Problems, 4, Met. 7
Metallurgy 14, Thesis, 10, Met. 11

## DEPARTMENT OF METALLURGY

This department is well supplied with representative ores of all the most important metals, drawings of furnaces, models and samples of all the different furnace products. The lectures treat of all the principal methods now in use. The practical work consists in visits to smelting and refining works which are accessible. The work in Metallurgy extends through three years.

### ASSAYING

The lectures treat of and describe apparatus, reagents, assay furnaces. fuels, etc., in connection with this subject. The principles of assaying and sampling are fully explained. A collection of representative ores of various metals with a collection of corresponding slags are shown, and instruction is given as to nature and quantity of fluxes. Special and rapid methods of testing slags and metallurgical products as employed in western smelting works are emphasized.

The laboratory course includes preparing and testing reagents, making cupels, etc., and assaying samples of ores, furnace and mill products, and bullion; different charges are tried and practical conclusions drawn.

Great importance is attached to the work in the laboratory. A large, well-ventilated furnace room in which are located muffle and crucible furnaces, and another room of similar dimensions equipped with desks, pulp and bead balances, afford accommodations to a large number of students. Ores of various metals of known value are given the students who are required to make up the necessary charges and submit their reports in detail. This work is offered to students completing the necessary courses in Mineralogy and Chemistry.

### ORE DRESSING

The lectures and recitations in Ore Dressing extend through the junior year, and comprise the detailed sutdy of ore dressing and concentrating machinery, together with the study of typical combinations of dressing machines as found in the several mining districts of the United States. In connection with the theoretic alwork, the ore dressing laboratory and testing plant of the School is utilized for practical illustrations.

### ORE TESTING

The lectures treat of the use and purposes of all the machinery connected with the subject, supplemented by detailed drawings. There are complete testing works, connected with the department where the student may see the working of, and handle for himself crushers, rolls, and concentrating machinery, as well as sizing apparatus and hydraulic separators. Sufficiently large amounts of ore are given to make the necessary tests upon the different machines and the students report the best method of treatment. The courses run through senior year and are required of students both in Mining and Metallurgy.

The ore-testing works meet educational, as well as commercial, needs.

*Educational.*—The ore-testing plant acquaints the student with the construction and manipulation of the principal typical machines used in the leading ore-dressing establishments of the country. It is here that students in Mining and Metallurgical Engineering get the requisite practical experience. They handle all machines and operate on sufficiently large amounts of material to determine the methods best suited to a given ore to extract the largest amount of metal with the least possible loss.

*Commercial.*—Ore-testing works are an important factor in mining and metallurgical projects. The commercial object is to determine the best method of treating a given ore so as to yield the largest percentage of the metal it contains at the least possible cost. Samples varying from 500 pounds to car-load lots can be treated by various methods.

As the funds appropriated for the erection of such a plant were sufficient to purchase only the necessary machinery, the business men of Minneapolis generously provided a suitable building. This building, 94 by 66 feet, is built of brick and stone.

## FIELD WORK IN METALLURGY

At the end of the junior year opportunity is given the student to study metallurgical operations at one or more smelting works. This work will begin about May 1. Not over two weeks' time will be devoted to this work.

Upon termination of the junior field work in Metallurgy and two weeks in Mining (not later than June 1), the members of the junior class who are candidates for the degree of Metallurgical Engineer, are required to spend at least six weeks in practical work in one or more of the smelters of the West, for which they may receive wages. The department will render all possible assistance in locating students in districts of their choice. Each student must keep a diary and record therein, in minute detail, all observations and sketches. He must, in person, submit this diary to the department on date of reopening of field work. In judging the character of the student's field work equal importance will be attached to the completed report and to the original field notes. The department reserves the right to reject note-books considered below the standard that should be demanded of candidates for senior work.

Field work will reopen at the School of Mines, Tuesday, September 19, 1916: No senior will be registered after that date. Registration will cover Field Work, Electric Power, and Geology.

The final reports covering field work in Metallurgy and Mining must be prepared at the School of Mines under the direct supervision of the departments concerned. The program covering this work is as follows: Metallurgy, September 19-26, inclusive; Mining and Mine Plant, September 27-October 9.

On October 9 all seniors who expect to graduate must register for the remaining subjects. Prior to this date the student must submit a type-

written report on field work fully illustrated with drawings, to scale, made from the field sketches, covering metallurgical and milling operations, and details of plant and equipment. Final registration will not be allowed until after reports on field work are accepted. All final reports, therefore, must be presented on or before October 9. These reports shall become the property of the School.

## METALLOGRAPHY

Courses in Metallography are offered to seniors who are candidates for the degree of Metallurgical Engineer, students in the Colleges of Science, Literature, and the Arts, Engineering, Chemistry, and the Graduate School.

These courses deal with the microscopic examination of metals, alloys, and ores. The lectures treat of and describe the apparatus used in connection with this subject, the methods of preparing specimens, the physical, chemical, and metallurgical principles involved, and the interpretation of the results of microscopic examination. A collection of specimens, micro-photographs, and lantern slides covering wrought iron, low carbon, structural, rail, and tool steels, brasses, bronzes, and other industrial alloys are available for study and comparison. The laboratory course includes the microscopic and pyrometric study of metals, alloys, and ores. The laboratory is equipped with microscopes, electric and portable gas furnaces, and pyrometers of the latest and improved types. A special dark room is available for the preparation of microphotographs.

# DEPARTMENTAL STATEMENTS

## EXPLANATION OF COURSE NUMBERS

Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. The suffixes *a* and *b* apply to one-semester courses offered both semesters, *a* indicating the first semester and *b* the second semester (e.g., 3a,b; 4a,b). The suffix *f* indicates summer field work.

All undergraduate courses are numbered from 1 to 100. All courses open to undergraduates and graduates are numbered from 101 to 200. Strictly graduate courses are numbered from 201 up.

## CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Instructors WOLDEMAR M. STERNBERG, STERLING TEMPLE, GERHARD DIETRICHSON; Assistant ARNOLD KIRKPATRICK.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 5. | Gen. & Anal. Chemistry... | 3 | 2 | All Fr. | .. |
| 6. | Gen. & Anal. Chemistry... | 1 | 6 | All Fr. | 5 |
| 11. | Quantitative Analysis..... | 1 | 6 | All Soph. | 6 |
| 12. | Quantitative Analysis..... | 1 | 6 | All Soph. | 11 |
| 24. | Iron & Steel Analysis..... | 1 | 6 | Sr. Met. E. | 12 |
| 25. | Ore & Slag Analysis..... | 1 | 6 | Sr. E. M. & Met. E. | 12 |
| 144. | Electrochemistry ..... | 1 | 4 | Sr. Met. E. | 12 |

5-6. GENERAL AND ANALYTICAL CHEMISTRY. An introduction to descriptive, physical, and metallurgical chemistry and qualitative analysis. FRANKFORTER, TEMPLE, and Assistants.

11-12. QUANTITATIVE ANALYSIS. A general discussion of quantitative methods, with laboratory work in gravimetric analysis, first semester; followed by a discussion of standard solutions and the necessary stoichiometric calculations with laboratory work in volumetric analysis, second semester. SIDENER, STERNBERG, and Assistants.

24. IRON AND STEEL ANALYSIS. Includes technical methods for the determination of the common constituents of iron ores, iron, and steel, with training in rapid work. SIDENER, STERNBERG.

25. ORE AND SLAG ANALYSIS. Rapid technical method for the determination of certain constituents in ores and slags. SIDENER, STERNBERG.

144. ELECTROCHEMISTRY. A discussion of electro-analytical methods and industrial electrochemical processes, and their underlying principles. DIETRICHSON.

## DRAWING AND DESCRIPTIVE GEOMETRY

Professor WILLIAM H. KIRCHNER; Instructors CHARLES H. BLITMAN, ROBERT W. FRENCH, FRANK B. ROWLEY.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 11. | Engineering Drawing | .. | 10 | All Fr. | |
| 12. | Engineering Drawing | .. | 8 | All Fr. | 11 |
| 13. | Descriptive Geometry | 2 | .. | All Soph. | 12, Math. 6 |
| 14. | Drafting | .. | 4 | All Soph. | 13 |

11. ENGINEERING DRAWING. Sketching, lettering, representation, parallel and radial projection, elements of engineering, representation of details of machines and structures, interpretation of working drawings. KIRCHNER, BLITMAN.

12. ENGINEERING DRAWING. Continuation of Course 11 as outlined above. The elements of general drafting, mechanical drawing as a language. Lines, views, dimensions, standards, signs, abbreviations, and explanatory notes. Maps and sketches. Brush and pen conventions. ROWLEY, BLITMAN.

13. DESCRIPTIVE GEOMETRY. Projection: central and special cases, principles and applications, representation of lines, planes, and solids, and of their relations; tangencies, intersections, and developments. Recitations, lectures, and solution of problems. KIRCHNER.

14. DRAFTING. Graphics, machine drafting, and structural drafting. Instruction in drafting room methods. FRENCH.

## ELECTRICAL ENGINEERING

Professor GEORGE D. SHEPARDSON; Assistant Professor WILLIAM T. RYAN.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 53. | Electric Power | 2 | 2 | Sr. E. M. & Met. E. | Physics 3, 4 |

53. ELECTRIC POWER. Elements of theory and practice of electrical measurements, wiring, dynamos, motors, and electric lighting. RYAN.

## EXPERIMENTAL ENGINEERING

Professor WILLIAM H. KAVANAUGH; Assistant Professors CHARLES F. SHOOP, FRANKLIN R. MCMILLAN.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 21. | Steam Laboratory | .. | 4 | Jr. E. M. & Met. E. | With Math. 11 |
| 22. | Strength of Materials | .. | 4 | Jr. E. M. & Met. E. | With Math. 10 |
| 24. | Experimental Laboratory | .. | 4 | Sr. E. M. & Met. E. | 21 |

21. STEAM LABORATORY. Exercises in valve setting, indicator practice, calibration of steam gauges, efficiency of screws and hoists. SHOOP.

22. STRENGTH OF MATERIALS. Laboratory work, investigating the strength and physical qualities of iron, steel, brass, copper, belting, chains, beams, brick, and stone. MCMILLAN.

24. EXPERIMENTAL LABORATORY. Hydraulic measurements. Calibration of weirs, nozzles, meters, and other hydraulic apparatus, calorimetry; tests of pumps, engines, and boilers. KAVANAUGH.

## GEOLOGY AND MINERALOGY

Professor WILLIAM H. EMMONS; Associate Professor CLINTON R. STAUFFER; Assistant Professor FRANK F. GROUT; Instructors A. WALFRED JOHNSTON, T. T. QUIRK; Assistants T. M. BRODERICK, W. L. UGLOW.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 1b. | General Geology | 3 | .. | All Soph. | 24 |
| 1f. | Field Work | .. | 2 wks | All Soph. | 1b and 105 |
| 11. | Paleontology | 3 | .. | Jr. E. M. (Geol.) | 1b |
| 12. | Paleontology | 3 | .. | Jr. E. M. (Geol.) | 11 |
| 23. | Elements of Mineralogy | 4 | 4 | All Fr. | .. |
| 24. | Descriptive Mineralogy | 2 | 2 | All Fr. | 23 |
| 73. | Histor. & Econ. Geology | 3 | .. | All Jr. | 1b and 105 |
| 105. | Elements of Rock Study | .. | 4 | All Soph. | 24 |
| 106. | Petrology | .. | 4 | All Soph. | 105b |
| 111. | Ore Deposits | 4 | .. | Sr. E. M. & E. M. (Geol.) | 106 |
| 112. | Problems in Ore Deposits | .. | 4 | Sr. E. M. & E. M. (Geol.) | 111 |
| 113. | Laboratory Course in Econ. Geology | .. | 4 | Sr. E. M. (Geol.) | With 111 |
| 124. | Struct. & Metamorph. Geol. | 3 | .. | Jr. E. M. (Geol.) | 73 and 105 |
| 138. | Testing Econ. Minerals | .. | 4 | Elective | 24 and 73 |
| 144. | Construction & Interpretation of Geologic Maps | .. | 4 | Elective | 73 |
| 151. | Advanced General Geology | 3 | .. | Sr. E. M. (Geol.) | 73 |
| 152. | Advanced General Geology | 3 | .. | Sr. E. M. (Geol.) | 151 |

1b. GENERAL GEOLOGY. A synoptical treatment of materials of the earth and of geologic processes. Physiographic, dynamic, and structural geology, with a brief introduction to Historical Geology. JOHNSTON.

1f. FIELD WORK. A two-week excursion to the Iron Ranges for practice in field methods, such as tracing contacts, working out structures and constructing and interpreting geologic maps. JOHNSTON and Assistants.

11. PALEONTOLOGY. A study of fossil forms with special reference to those of geological importance. STAUFFER.

12. PALEONTOLOGY. Faunas and their correlation. A continuation of Course 11. STAUFFER.

23. ELEMENTS OF MINERALOGY. The crystal systems; morphological, physical, and chemical character of minerals; occurrence, genesis, and uses of minerals; classifications and description of common minerals. Determinative work in laboratory, blowpipe analysis, sight identification. GROUT, BRODERICK, UGLOW.

24. DESCRIPTIVE MINERALOGY. A continuation of Course 23, special attention being given to metalliferous and rock-forming minerals. Laboratory determination and sight identification. The use of the goniometer and microscope. Laboratory work, reference reading, and field excursions. GROUT, BRODERICK, UGLOW.

73. HISTORICAL AND ECONOMIC GEOLOGY. (a) Historical Geology. The geologic history of North America, with special reference to its syngenetic mineral deposits. (b) Economic Geology. A study of the non-metallic minerals of economic value, and discussions of the geologic guides to prospecting for these deposits. EMMONS, QUIRK.

105. ELEMENTS OF ROCK STUDY. The occurrence and genesis of igneous sedimentary, and metamorphic rocks; their mineral and chemical composition; their structure, texture, and alteration. The classification and methods of identification and description of rocks. BRODERICK.

106. PETROLOGY. 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. BRODERICK.

111. 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. EMMONS.

112. PROBLEMS IN ORE DEPOSITS. Field excursions, map work, lectures on field and laboratory methods. EMMONS.

113. LABORATORY COURSE IN ECONOMIC GEOLOGY. A study of ores, rocks and geological structure of selected American and foreign mining districts. Correlated reading. EMMONS.

124. STRUCTURAL AND METAMORPHIC GEOLOGY. The conditions, processes, and results of metamorphism; structural features resulting from deformation under varying conditions of load. JOHNSTON.

138. TESTING ECONOMIC MINERALS. Methods of determining quality of mineral deposits, described and illustrated by laboratory tests of coal, oil, building stone, and metallic ores.

144. CONSTRUCTION AND INTERPRETATION OF GEOLOGIC MAPS. Hours to be arranged. Methods of geologic examination; problems in construction and interpretation of geologic maps and sections, with special

reference to underground mapping of metalliferous areas; field practice in plane table methods of topographic and geologic mapping. QUIRK.

151. ADVANCED GENERAL GEOLOGY. Geologic processes and their results; development of the North American continent. STAUFFER.

152. ADVANCED GENERAL GEOLOGY. A continuation of Course 151. STAUFFER.

## GERMAN

Professor CARL SCHLENKER; Assistant Professors OSCAR C. BURKHARD, Instructors J. THEODORE GEISSENDOERFER, RICHARD WISCHKAEMPER.

### COURSES

| No. | Title | Lect. or rec. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|
| 15. | Beginning German | 3 | Jr. E. M. (Geol.) | .. |
| 16. | Beginning German | 3 | Jr. E. M. (Geol.) | 15 |
| 17. | Scientific Intermediate | 3 | Jr. or Sr. E. M. (Geol.) | 16 |
| 18. | Scientific Intermediate | 3 | Jr. or Sr. E. M. (Geol.) | 17 |
| 23. | Advanced Scientific | 3 | Sr. E. M. (Geol.) | 18 |
| 24. | Advanced Scientific | 3 | Sr. E. M. (Geol.) | 23 |

15-16. BEGINNING. Pronunciation, grammar, conversation, and composition; selected reading in easy prose and verse. BURKHARD.

17-18. SCIENTIFIC INTERMEDIATE. This course is arranged to meet the needs of students in the School of Mines. Text: Merckel's *Bilder aus der Ingenieurtechnik*. BURKHARD.

23-24. ADVANCED SCIENTIFIC READING. Reading of monographs and periodicals. GEISSENDOERFER, WISCHKAEMPER.

## MECHANICAL ENGINEERING

Professor JOHN J. FLATHER; Assistant Professor S. CARL SHIPLEY; Instructors EDWARD QUIGLEY, WILLIAM H. RICHARDS.

### COURSES

| No. | Title | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|
| 1a. | Pattern Making | 6 (9 wks) | 1st-yr. E. M. & Met. E. | .. |
| 1b. | Foundry | 6 (9 wks) | 1st-yr. E. M. & Met. E. | .. |
| 1c. | Forge | 6 (9 wks) | 1st-yr. E. M. & Met. E. | .. |
| 1d. | Machine & Bench work | 6 (9 wks) | 1st-yr. E. M. & Met. E. | .. |

1a. PATTERN MAKING. Use of tools, lathe and bench work, making of timber joints, core boxes and flasks. RICHARDS.

1b. FOUNDRY. Molding, core making, mixing and casting metals. QUIGLEY.

1c. FORGE. Use of tools, forging, welding, tool dressing and tempering. QUIGLEY.

1d. MACHINE AND BENCH WORK. Use of tools and elementary machine operations. SHIPLEY.

## METALLURGY

Professors WILLIAM R. APPLEBY, PETER CHRISTIANSON, LEVI B. PEASE; Assistant Professor SAMUEL L. HOYT; Instructor ERVIN W. MCCULLOUGH.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 2. | Assaying | 4 | 8 | All Fr. | Chem. 5, Mineral. 23 |
| 3. | Gen. Met. & Iron and Steel | 3 | .. | Soph. E. M. & Met. E. | 2, Chem. 6 |
| 4. | Wrought Iron & Steel | 3 | .. | Soph. E. M. & Met. E. | 3 |
| 5. | Ore Dressing | 4 | .. | All Jr. | .. |
| 6. | Ore Dressing | 4 | .. | All Jr. | .. |
| 6f. | Field Work in Metallurgy | .. | 10 dys | Jr. E. M. & Met. E. | Satisfactory completion of Jr. year |
| 7. | Ore Testing | 2 | 8 | Sr. E. M. & Met. E. | 106, 5 |
| 8. | Special Problems in Ore Testing | .. | 4 | Sr. E. M. & Met. E. | 7 |
| 11. | Special Problems in Met. | .. | 8 | Sr. Met. E. | 106, 5 |
| 14. | Thesis and Specifications | .. | 10 | Sr. Met. E. | 11 |
| 105. | Met. of Base Metals | 4 | .. | Jr. E. M. & Met. E. | 4 |
| 106. | Met. of Precious Metals | 4 | .. | Jr. E. M. & Met. E. | 105 |
| 109. | Electrometallurgy | 3 | .. | Sr. Met. E. | 106 |
| 152. | Metallography | 2 | 4 | Sr. Met. E. | 106 |
| 153. | Metallography | 3 | 4 | Elective | Chem. 12, Phys. 1 and 2 |
| 154. | Metallography | 3 | 4 | Elective | 153 |
| 155. | Metallog. for Geologists | 2 | 2 | Elective | Geol. 4, 5 & 18 |
| 156. | Metallog. for Geologists | 2 | 2 | Elective | 155 |
| 157. | Metallog. for Engineers | 2 | 4 | Elective | Mech. Eng. 3 and 4 |
| 160. | Metallog. for Chemists | 2 | 2 | Elective | Chem. 12, Phys. 1 and 2 |
| 162. | Ad. Metallog. for Eng. | 2 | 4 | Elective | 157 |
| 163. | Dental Metallog. | 3 | .. | Elective | .. |
| 201. | Ad. Metallog. | To be ar. | | Elective | 154 |
| 202. | Ad. Metallog. | To be ar. | | Elective | 201 |

2. ASSAYING. Determination of values of ores, metallurgical products, and bullion. APPLEBY and Assistants.

3. GENERAL METALLURGY AND METALLURGY OF IRON. Including the subjects of combustion, fuels, refractory materials and furnaces. Lectures and recitations on metallurgy of iron. CHRISTIANSON.

4. METALLURGY OF WROUGHT IRON AND STEEL. Consideration of the principles of manufacture, details of plant construction, and chemical and physical phenomena. CHRISTIANSON.

5-6. ORE DRESSING. Examination of ores, crushing, sizing classification, and methods of mechanical separation. McCULLOUGH.

6f. FIELD WORK IN METALLURGY. Study of metallurgical operations at smelters and mills. Detailed report is required covering plants visited. CHRISTIANSON, PEASE.

7. ORE TESTING. Determinations of methods of ore treatment, stamping, concentration, cyanidation, roasting, and amalgamation. CHRISTIANSON and Assistants.

8. SPECIAL PROBLEMS IN ORE TESTING. Continuation of Course 7. PEASE and Assistants.

11. SPECIAL PROBLEMS IN METALLURGY. Research work preparatory to thesis. APPLEBY and Assistants.

14. THESIS AND SPECIFICATIONS. Detailed investigations of ore treatment, with report including designs and specifications for suitable plants. APPLEBY, COMSTOCK, and Assistants.

105. METALLURGY OF THE BASE METALS. Lead, copper, zinc, and mercury. Consideration of smelting methods and principles involved in refining methods. PEASE.

106. METALLURGY OF THE PRECIOUS METALS. Gold, silver, and platinum. Methods and principles of cyanidation, chlorination, amalgamation, and lixiviation as applied to the treatment of the above. PEASE.

109. ELECTROMETALLURGY. A study of the reduction of ores, refining of metals, and production of metals by electrolytic deposition; and the use of the electric furnace for smelting of ores, refining metals, and the manufacture of refractory alloys. CHRISTIANSON.

152. METALLOGRAPHY. A study of the microstructure of metals and alloys as affected by heat and industrial treatments, together with the influence of changes of structure on their properties. Special attention is given to siderurgic products. HOYT.

153-154. METALLOGRAPHY. Theory of metallic alloys. Metallographic technique. Properties of metals and alloys. Metallography of iron and steel and commercial alloys. Technical metallography. HOYT.

155-156. METALLOGRAPHY APPLIED TO THE STUDY OF GEOLOGY. Physicochemical principles and their application to the study of the genesis of rocks and ore bodies. Microscopical examination and synthetic preparation of opaque minerals. HOYT.

157. METALLOGRAPHY FOR ENGINEERING STUDENTS. Metallurgy of iron and steel. Microscopic and thermal analysis of steel and cast iron; heat and mechanical treatment. The properties of iron and steel as affected by composition and treatment. Laboratory work. HOYT.

160. METALLOGRAPHY FOR CHEMICAL STUDENTS. The preparation of metallic alloys; their microscopical and thermal analysis. Steel and other commercial alloys with particular reference to chemical metallurgy. Corrosion of steel and non-ferrous alloys. Metallography applied to analytical chemistry. HOYT.

162. ADVANCED METALLOGRAPHY FOR ENGINEERING STUDENTS. Metallography applied to engineering practice; machine design, structural engineering, electrical engineering. Engineering specifications involving the use of metals and alloys. HOYT.

163. DENTAL METALLOGRAPHY. Study of the dental alloys from the standpoint of metallography. HOYT.

201-202. ADVANCED METALLOGRAPHY. Technical and scientific research. The study of steel rails, automobile and locomotive parts, tool steels etc. Special problems in metallography with outside reading. Seminar work on the recent advances in metallography. HOYT.

## MINE PLANT AND MECHANICS

Professor ELTING H. COMSTOCK; Assistant Professor EDWIN M. LAMBERT; Instructor EDWARD W. DAVIS.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 1. | Computation & Mensuration | 3 | .. | All 1st-yr. students | .. |
| 3. | Mine Accounting | .. | 6 | All 1st-yr. students | .. |
| 4. | Algebra | 4 | .. | All 1st-yr. students | .. |
| 5. | Algebra & Trigonometry | 6 | .. | All Fr. | 1 & 2 |
| 6. | Spherical Trig. & Anal. Geom. | 6 | .. | All Fr. | 5 |
| 7. | Calculus | 5 | .. | All Soph. | 6 |
| 8. | Calculus | 3 | .. | All Soph. | 7 |
| 9. | Mechanics | 5 | .. | All Jr. | 8 |
| 10. | Mechanics | 6 | .. | All Jr. | 9 |
| 11. | Mine Plant | 5 | .. | Jr. E. M. & Met. E. | 8 |
| 12. | Mine Plant | 6 | .. | Jr. E. M. & Met. E. | 11 |
| 13. | Hydraulics & Water-Power | 5 | .. | All Sr. | 10 |
| 15. | Engineering Construction | 1 | 4 | Sr. E. M. & Met. E. | 10 |
| 16. | Mine Plant Design | .. | 10 | Sr. E. M. | 15 |
| 18. | Mill and Smelter Design | .. | 6 | Sr. Met. E. | 15 |

1. COMPUTATION AND MENSURATION. Demonstrations of most important theorems of solid geometry. Volumes, approximate volumes, prismoidal formula, etc. Approximate computation, graphs, and graphical computation, logarithms and logarithmic computation, areas and approximations of areas, use of slide rule. DAVIS.

3. ELEMENTARY MINE ACCOUNTING. Elementary accounting in general; applications to mine accounts; primary records, labor, supply, mine and mill products, and fund sheets; secondary records, invoice, labor and supply, mine and mill cost sheets, trial balance. LAMBERT.

4. ALGEBRA. Equations with one, two, or more unknown quantities, inequalities, involution and evolution, theory of exponents, surds, quadratic equations both numerical and literal, equations with one or more unknown quantities that can be solved by means of quadratic equations, progressions. DAVIS.

5. ALGEBRA AND TRIGONOMETRY. Functions and functional notation, factor and remainder theorems, factors and values of functions, determinants, development of functions, theory of equations, permutations and combinations; trigonometric ratios, right triangles, general definitions of trigonometric functions, analytic relations, addition formulas, trigonometric equations, and oblique triangles. DAVIS.

6. SPHERICAL TRIGONOMETRY AND ANALYTICAL GEOMETRY. General properties and solution of spherical triangles; systems of coördinates, loci, equations and properties of the straight line, transformation of coördinates, equations and properties of conics, general equations of the second degree, higher plane curves, space coördinates, point, plane, straight line, quadric surfaces. DAVIS.

7. CALCULUS. Nature of differentiation, elementary forms, geometric applications, rates, successive differentiation, maxima and minima, expansion of functions, indeterminate forms, partial derivatives, change of variable. LAMBERT.

8. CALCULUS. Elementary integration, undetermined coefficients, rational fractions, rationalization, formulas of reduction, hyperbolic functions, some differential equations of mechanics. LAMBERT.

9. MECHANICS. Composition and resolution of forces, laws of equilibrium, practical applications, rectilinear motion, circular motion, curvilinear motion in general, dynamics of rigid bodies, impact, work and energy; elementary mechanics of materials. LAMBERT.

10. MECHANICS. Mechanical and elastic properties of materials of construction; beams, shafts, columns, reinforced concrete, hollow cylinders and spheres, rollers, plates; theory of internal stress. LAMBERT.

11-12. MINE PLANT. Discussion of the machinery and appurtenances employed in the equipment of mines. Air compression, mechanical features of hoisting, pumping, ventilation, underground transportation. Electricity applied to mining. COMSTOCK.

13. HYDRAULICS AND WATER-POWER. Laws of the equilibrium, pressure, and flow of liquids, estimation of power to be developed at a power site, dams and appendages, theory of water wheels and turbines, speed control, power-house equipment, transmission. COMSTOCK.

15. ENGINEERING CONSTRUCTION. Theory of structures, loading, analytic and graphic resolution of stresses in framed structures, stresses in mining structures, design of mining structures. LAMBERT.

16. MINE PLANT DESIGN. A study of power possibilities, costs, etc., and designs of a power plant, surface equipment, and structures for a mine. COMSTOCK.

18. MILL AND SMELTER DESIGN. A study of the construction and mechanical equipment of mills and smelters in connection with thesis work. COMSTOCK.

## MINING ENGINEERING

Professor EDWARD P. MCCARTY; Instructor JOHN F. MURPHY.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 1. | Mine Surveying | 3 | .. | All Soph. | Math. 6 |
| 2. | Mine Surveying | 3 | .. | All Soph. | 1 |
| 2f. | Field Work | .. | 7 wks | All Soph. | 2 |
| 4. | Mine Mapping | .. | 6 | All Jr. | 2f |
| 6. | Mining | 1 | .. | All Soph. | .. |
| 9. | Mining | 5 | .. | All Jr. | 6 |
| 10. | Mining | 5 | .. | All Jr. | 9 |
| 10f. | Practical Mining | .. | 2 wks | All Jr. | Satisfactory completion of Jr. year |
| 11. | Mining | 5 | .. | Sr. E. M. & E. M. (Geol.) | 10 |
| 12. | Mining | 5 | .. | Sr. E. M. & E. M. (Geol.) | 11 |
| 13. | Thesis | .. | 2 | Sr. E. M. | 10f |
| 14. | Thesis | .. | 8 | Sr. E. M. | 13 |

1, 2. MINE SURVEYING. Computation, platting, and problems with special reference to mine surveying. MURPHY.

2f. FIELD WORK. Practice in general surveying during the month of May. Practice in underground surveying during the first two weeks of June. This work is given on the Iron Ranges. MCCARTY, MURPHY.

4. MINE MAPPING. Mine mapping in accordance with prevalent practice in the western mining districts. Ore and stripping estimates and mine maps based on Mesabi Range practice. MURPHY.

6. MINING. Examination and testing, and use of explosives. MURPHY.

9. MINING. Occurrence of ore bodies, prospecting, churn and diamond drilling, drilling, blasting, excavation, surface transportation, tunneling and drifting. MCCARTY.

10. MINING. Shaft-sinking, support of underground excavations, hoisting, drainage, ventilation, underground transportation. MCCARTY.

10f. PRACTICAL MINING. Study of mining operations. Mine plant and equipment and practical mining work; a mine to be selected by department during months of May, June, July, and August. MCCARTY, COMSTOCK, and Assistants.

11. MINING. Open pit, quarrying, underground methods, coal mining. mining alluvial deposits. McCARTY.

12. MINING. Mine management, mining law, economics of mining, mine examination, mine sanitation and hygiene. McCARTY.

13, 14. THESIS. Conference. Design and specifications of mining details required in thesis study. McCARTY and Assistants.

## PHYSICS

Professors HENRY A. ERIKSON, ANTHONY ZELENY; Instructor E. O. DIETERICH.

### COURSES

| No. | Title | Lect. or rec. hrs. | Lab. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|---|
| 1. | General Physics | 3 | .. | All Soph. | Math. 6 |
| 2. | General Physics | 3 | .. | All Soph. | 1 |
| 3. | General Lab. Practice | .. | 2 | All Soph. | With 1 |
| 4. | General Lab. Practice | .. | 2 | All Soph. | With 2 |

1. GENERAL PHYSICS. Mechanics of solids and fluids, sound and heat. Treatment experimental rather than mathematical; the fundamental principles. ERIKSON. DIETERICH.

2. GENERAL PHYSICS. Light, electricity, and magnetism. Treatment experimental; the fundamental principles, including those of radioactivity, ionization, X-radiation, and the electrical constitution of matter. ERIKSON, DIETERICH.

3. GENERAL LABORATORY PRACTICE. Physical measurements in the mechanics of solids and fluids, and in heat and sound, giving the student a knowledge of experimental methods, and an intimate acquaintance with the fundamental facts of the subject. DIETERICH.

4. GENERAL LABORATORY PRACTICE. Physical measurements in light, electricity, and magnetism. DIETERICH.

## ROMANCE LANGUAGES

Professor EVERETT WARD OLMSTED; Assistant Professor JULES T. FRELIN; Instructor E. H. SIRICH.

### COURSES

| No. | Title | Rec. hrs. | Required of | Prereq. courses |
|---|---|---|---|---|
| 1. | Beginning French | 3 | Jr. E. M. (Geol.) | .. |
| 2. | Beginning French | 3 | Jr. E. M. (Geol.) | 1 |
| 3. | Intermediate French | 3 | Jr. or Sr. E. M. (Geol.) | 2 |
| 4. | Intermediate French | 3 | Jr. or Sr. E. M. (Geol.) | 3 |
| 5. | Survey French Lit. | 3 | Sr. E. M. (Geol.) | 4 |
| 6. | Survey French Lit. | 3 | Sr. E. M. (Geol.) | 5 |

1-2. BEGINNING FRENCH. Stress on accurate pronunciation, reading, reading vocabulary, and the essentials of grammar. Daily oral and written exercises (dictation and reproduction in French). FRELIN, SIRICH.

3-4. INTERMEDIATE. French grammar, composition, and reading; increased use of French in the classroom. Selections from modern prose and poetry. FRELIN.

5-6. GENERAL SURVEY OF FRENCH LITERATURE. Lectures, recitations, and assigned readings. Designed to cover the whole period in historical outline. Selections from representative authors. OLMSTED.

# STUDENTS

## SENIORS—11

Abrahamson, Hjalmar, Wadena
Aronson, Sam, St. Paul
Buresch, Charles E., Lakefield
Craig, John J., Minneapolis
Davies, Fred A., Minneapolis
Dovre, Adolph, Sleepy Eye
Krogh, Alvin T., Minneapolis
Lee, Oscar, St. Paul
McDermid, Archie, Duluth
McHardy, Roy H., Minneapolis
Nord, Harry H., Ashland, Wis.

## JUNIORS—15

Anderson, Edwin H., Oakes, N. D.
Cassilly, Thomas E., St. Paul
Coryell, Lewis S., Osceola, Wis.
Dennis, Richard C., Ashland, Wis.
Dopp, Lawrence, Ashland, Wis.
Elson, William H., St. Paul
Ernster, Omer F., Brainerd
Fearing, Edward J., Little Falls, Minn.
Kwong, Yih-Kum, Shanghai, China
Levorsen, A. Irving, Fergus Falls
Peterson, Paul A., St. Paul
Shattuck, Warner A., Bisbee, Ariz.
Sweetman, Edwin A., Aitkin
Wallace, Carleton S., Minneapolis
Woodruff, John J., Minneapolis

## SOPHOMORES—26

Ainsworth, Robert E., Minneapolis
Allard, Raymond, St. Paul
Armstrong, Harold K., Minneapolis
Bailey, A. Kittredge, Minneapolis
Clark, Fred E., Minneapolis
Copeland, William A., St. Paul
Cowin, Percy G., Minneapolis
Dane, Carleton M., St. Paul
Dowdell, Ralph L., St. Paul
Foley, Lyndon L., Minneapolis
Frank, Harry, Minneapolis
Gannett, Roger W., Minneapolis
Hicks, John, St. Paul
Hsieh, Chung, Kirin, China
Hubbard, William E., Duluth
Ingersoll, Guy E., Hibbing
Jerrard, Walter L., St. Cloud
Johnson, Russell V., Lanesboro
Lee, Liang, Ningyuen, China
McGilvra, Donald, Minneapolis
Miao, Yun Tai, Yunnanfu, China
Moga, John A., St. Paul
Quinn, Howard E., Melrose
Sinclair, Gilbert, Minneapolis
Stickney, Robert A., Englewood, N. J.
Sullivan, Daniel C., Stillwater

## FRESHMEN—17

Abramson, Jake, Minneapolis
Barr, Joseph C., Riverton
Calhoun, Robert, Minneapolis
Donaghue, Abner J., Minneapolis
Flom, Frank, Minneapolis
Frank, Elden J., Duluth
Frellsen, Sidney A., Minneapolis
Gandrud, Bennie W., Glenwood
Goldberg, Bert, St. Paul
Goldberg, Samuel B., St. Paul
Hosted, Joseph, Duluth
Hoving, George E., Fergus Falls
Moriarty, Howard M., Minneapolis
Mellem, Walter R., St. Paul
Mullowney, Marion F., Minneapolis
Newton, Valentine H., New York
Wadsworth, Lawrence H., Minneapolis

## FIRST YEAR—7

Berlin, Hale D., Wimbledon, N. D.
Case, Carlos C., Minneapolis
Johnsen, Trygve, St. Paul
Johnston, Kenneth A., St. Paul
Rydlun, Edwyn, Minneapolis
Salet, Harry N., St. Paul
Thoeni, Victor T., Wykoff, Minn.

# Bulletin of
# The University of Minnesota

# THE
# COLLEGE OF PHARMACY

## 1916-1917


VOL. XIX, NO. 11. MAY 1916

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Minneapolis, Minn.

## 1916

### JULY

| Su | Mo | Tu | W | Th | Fr | Sa |
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## 1917

### JANUARY

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### FEBRUARY

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### APRIL

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### MAY

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### JUNE

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### JULY

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### AUGUST

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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| 30 | 31 | .. | .. | .. | .. | .. |

# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees. |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School closes |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |

| | | | |
|---|---|---|---|
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 11 | Monday | Senior Class Day exercises |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fourth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

# THE COLLEGE OF PHARMACY

## FACULTY

George Edgar Vincent, Ph.D., LL.D., President 1005 5th St. S. E.
Cyrus Northrop, LL.D., President, Emeritus 519 10th Ave. S. E.
Frederick J. Wulling, Ph.G., Phm.D., LL.M., Dean, Professor of Pharmacology and Director of the University Medicinal Plant Gardens 3305 2nd Ave. S.
Gustav Bachman, Phm.D., Phm.M., Assistant Professor of Pharmacy 2624 Fremont Ave. S.
Richard Olding Beard, M.D., Associate Professor of Physiology Hotel Hastings
Herbert F. Bergman, B.S., Assistant Professor of Botany 723 7th St. S. E.
Edgar D. Brown, Phm.D., M.D., Associate Professor of Pharmacology 3525 3rd Ave. S.
Frederick K. Butters, B.S., B.A., Assistant Professor of Botany 815 S. 7th St.
Frederick E. Clements, Ph.D., Professor of Botany 508 5th Ave. S. E.
Louis J. Cooke, M.D., Director Physical Education for Men 909 6th St. S. E.
George B. Frankforter, M.A., Ph.D., Professor of Chemistry 525 E. River Road
Frank F. Grout, M.S., Assistant Professor of Geology and Mineralogy 623 13th Ave. S. E.
Ned L. Huff, M.S., Assistant Professor of Botany 1219 7th St. S. E.
William H. Hunter, Ph.D., Assistant Professor of Organic Chemistry 112 Church St. S. E.
Winford P. Larson, M.D., Assistant Professor of Bacteriology 614 9th Ave. S. E.
Bernard Lentz, Professor of Military Science and Tactics 721 S. E. 7th
Edwin L. Newcomb, P.D., Phm.M., Associate Professor of Pharmaceutical Botany and Pharmacognosy 719 6th Ave. S. E.
J. Anna Norris, M.D., Director Physical Education for Women 828 University Ave. S. E.
Walter F. Rhinow, Assistant Commandant 400 Oak St. S. E.
Harold E. Robertson, B.A., M.D., Professor of Bacteriology 507 Essex St. S. E.
Carl O. Rosendahl, Ph.D., Professor of Botany 2191 Commonwealth Ave., St. Paul
Frederick H. Scott, Ph.D., M.D., D.Sc., Associate Professor of Physiology 1307 6th St. S. E.
Charles F. Sidener, B.S., Professor of Quantitative Chemistry 1320 5th St. S. E.

ANNE G. BENTON, B.A., Instructor in Bacteriology 2024 Queen Ave. S.
OSCAR J. BLOSMO, Ph.C., M.S. in Phm., Instructor in Dispensing The Leamington
ROSCOE H. CARTER, B.A., M.S., Instructor in Chemistry 500 Beacon St. S. E.
WILLIAM K. FOSTER, LL.M., Assistant Director Physical Education for Men 652 Erie St. S. E.
ARTHUR T. HENRICI, M.D., Instructor in Bacteriology 939 14th Ave. S. E.
WILLIAM JOHNSON, M.D., Instructor in Clinical Microscopy 313 8th Ave. S. E.
MAY S. KISSOCK, B.A., Instructor, Physical Education for Women 1309 7th St. S. E
WOLF KRITCHEVSKY, D.Sc., Instructor in Chemistry 1122 James Ave. N.
CHAUNCEY J. V. PETTIBONE, Ph.D., Instructor in Physiology 611 S. E. Delaware
VALERIA G. LADD, B.A., Instructor, Physical Education for Women 1445 E. River Road
....., Instructor in Pharmaceutical Chemistry and Pharmacy
BERT A. ROSE, Instructor of Band 710 7th St. S. E.
WALDEMAR M. STERNBERG, B.A., Instructor in Chemistry 811 Essex St. S. E.
EARLE KENNETH STRACHAN, Ph.D., Instructor in Chemistry 941 14th Ave. S. E.
ALICE H. TOLG, M.D., Instructor, Physical Education for Women University of Minnesota
JOHN C. WEST, B.S., Instructor, Physical Education for Men 411 17th Ave. S. E.
DONALD FOLSOM, B.A., Assistant in Botany 1110 S. E. 5th
C. NAUMANN MCCLOUD, Phm.D., M.D., Lecturer on First Aids to the Injured 524 Lowry Bldg., St. Paul
FLOYD E. JOYCE, B.A., Assistant in Chemistry 1212 5th St. S. E.
JAMES L. TITUS, Phm.B., Assistant in Dispensing 316 15th Ave. S. E.
DEL D. TURNER, Ph.C., Assistant Laboratory Instructor 1205 5th St. S. E.

# GENERAL INFORMATION

The twenty-fifth annual course of the College of Pharmacy begins and ends as per calendar on page three.

## ENTRANCE REQUIREMENTS

### ADMISSION BY CERTIFICATE

Diplomas, certificates, or other evidences of the completion of a regular four-year high school course, or its educational equivalent, are required for admission. (In accordance with an informal agreement between the College and the State Pharmaceutical Association covering the period ending with 1920, in certain meritorious cases exceptionally good drug-store or pharmaceutical laboratory experience may be accepted in place of a minor fraction of high school work). While at present a diploma from an accredited high school admits to the College, prospective applicants are strongly urged to prepare themselves in four years of English, two years of Latin, two years of either German or French higher algebra, plane geometry, physics and botany and, if possible, chemistry and physiology. In the near future completion of these subjects will be made prerequisites to entrance.

### ADMISSION BY EXAMINATION

Students may take examinations in subjects for which they have no certificates. A high school training covers fifteen units, a unit being a school year of standard work in a given subject. State High School Board certificates and College Entrance Examination Board certificates are accepted in lieu of examinations.

### NEW STUDENTS

All applicants for admission should request their high school principals or superintendents to send a complete transcript of their records to the Registrar of the University as early as possible and not later than September 1. Upon receipt of the credentials the Registrar will notify the applicant concerning his admission and will forward directions for registration. See calendar, page 3, for registration dates.

### OLD STUDENTS

In August the Registrar will send to all students who were in college the preceding year complete registration material. Those who fail to receive this by August 20 should write for proper blanks. See calendar for dates of registration and payment of fees.

## FEES AND OTHER EXPENSES

The annual incidental fee of $55 includes all laboratory fees, and is payable, one half at the beginning of each semester. Certificates entitling the student to admission to classes will not be issued until the fees have been paid.

All students are required to pay the following fees:

| | |
|---|---|
| Annual deposit covering all laboratories, etc. | $5.00 |
| Minnesota Union membership, (required of men), a semester | 1.00 |
| Condition examination fee, each subject | 1.00 |
| Military uniform | 15.00 |
| Gymnasium suit, for those electing this work | 5.00 |
| Miscellaneous equipment | 5.00 |

First graduate course students pay a tuition fee of $10 each semester, plus an annual deposit of $5.

Those desiring to take special work may pay fees on a clock hour basis, the rate being $3 an hour; e. g., a student doing 15 hours of work a week throughout the semester, would pay $45.

## GRADUATION REQUIREMENTS

Regular attendance at lectures, recitations, and laboratory exercises is required. Students will not be permitted to present themselves for final examination unless they have been in attendance upon at least seven eighths of the total work of the course.

Every person upon whom any degree is conferred must be of good moral character and at least twenty-one years old; must have attended three full lecture and laboratory courses, the last at this College, and must have passed examinations in the subjects required for graduation.

Drug-store experience is not a requirement for graduation.

## ADVANCED STANDING

Applicants for advanced standing must pass the entrance examinations or present the usual equivalents. They must furnish satisfactory evidence of time spent and subjects covered in previous professional studies, and must pass the examinations of all departments in which they desire credit, if such examinations are deemed necessary by the professors in charge. Students will not be permitted to substitute private work in any branch for the regular course work.

## UNCLASSED STUDENTS

Unclassed or special students may enter at any time provided there is laboratory room for them. They will not be rated in their work or examined unless they make special request therefor. Work completed

will be credited should the students subsequently enter the regular course, providing they meet the full entrance requirements.

## EXAMINATIONS AND STANDINGS

Examinations are held at the end of the regular school year and during the last week of the first semester and are supplementary to the written and practical tests and quizzes that are held at frequent intervals during the year, and, with them, form largely the basis of final determination of fitness for promotion or graduation.

The standing of students is indicated by the letters A, B, C, D, (A highest, D lowest passing mark), E (conditioned), I (incomplete) and F (failure). Conditions may be removed as indicated below. Incomplete work must be made up before the final examinations of the following year.

In order to become eligible for final examinations students are required to attend at least seven-eighths of the lectures in each course. This does not apply to laboratory courses which must be taken in full and must be entered during the first week in which they begin.

Students having conditions in more than two major or in more than three minor subjects of the first year can not enter upon the second year's work. All entrance conditions must be removed before the next spring examination. Candidates for graduation must have removed all conditions before entering upon the second semester of the graduating year.

Condition examinations are held during the first week of the course in September and during the week following Easter vacation. The dates are usually posted in June and March. Conditioned students are required to inform themselves as to these dates as soon as they learn that they are conditioned, as no other notice is given. A fee of one dollar is charged for a condition examination. Failure at the condition examination necessitates a repetition of the subject. Students who carry a condition into a succeeding year may find a conflict of lecture or laboratory hours. In such cases they are to give preference to the lower course.

Absence will not be excused unless satisfactory reasons are given. Habitual absence without a satisfactory excuse, continued indifference to study, or persistently poor scholarship may subject the student to temporary or permanent suspension. Students are strongly advised to be present at the beginning of the school year, but those who can not enter in the fall may enter at the beginning of the second semester, taking any of the subjects beginning then. Any of the facilities afforded by the University are open to the students of this College, subject to the approval of the Dean. Opportunity is afforded to do advanced work in all branches. Textbooks may be obtained after coming to the University.

Students find their time fully occupied. Practicing pharmacists who desire to take certain branches of study may avail themselves of any of the college facilities.

## MEDICINAL PLANT LABORATORY AND GARDEN

Students receive instruction in medicinal plant culture and in the harvesting, drying, preparing, and milling of drugs in the very representative medicinal plant garden and in the plant laboratory and conservatory. The garden and plant laboratory have been added to increase the educational facilities of the College. The College has no experience or information concerning the commercial cultivation of medicinal plants.

## DISPENSARY PRESCRIPTION PRACTICE

The seniors under competent direction and supervision dispense the prescriptions written by the physicians in the Out-Patient Department of the University Hospitals. During the past year upwards of twenty thousand prescriptions were filled, most of them formulated ones, only a negligible percentage calling for proprietaries.

## ELECTIVES IN OTHER UNIVERSITY COLLEGES

Students may elect certain subjects in other University Colleges, if such election does not interfere with their regular work. Subjects elected must be approved by the Dean and must be satisfactorily completed before the student can graduate.

## COLLEGE TRAINING FOR PHARMACISTS

The recognition of the need of substantial college training for pharmacists finds expression in many ways. In New York, Pennsylvania, Hawaii, Wisconsin, Ohio, Louisiana, and Washington, such training is obligatory either by law or by rule of the boards of pharmacy. In a number of other states credit is given for college work. In Minnesota graduates from recognized colleges are required to have only two years of practical experience while all others must have four years of drug-store experience before they become eligible for examination by the State Board of Pharmacy for full license to practice in Minnesota. Graduates of the three-year course who have gained practical experience concurrently with their college work need only one additional year of drug-store experience before they become eligible for examination for full registration.

## POSITIONS FOR GRADUATES

The demand for graduates of this College has always been greater than the supply and is continually growing. Practically all members of the senior class are engaged before graduation. This College is recognized in all states, including those in which standards of efficiency have been established.

## STATE BOARD OF PHARMACY

The State Board of Pharmacy meets at the College four times each year to examine candidates for registration. For information concerning

the board or state examinations, address the Secretary of the Board, Mr. E. A. Tupper, 745 E. 14th St., Minneapolis, Minnesota.

## THE AMERICAN CONFERENCE OF PHARMACEUTICAL FACULTIES

The College of Pharmacy of the University of Minnesota is one of the colleges constituting the membership of the American Conference of Pharmaceutical Faculties.

## THE NORTHWESTERN BRANCH OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

The Northwestern Branch of the American Pharmaceutical Association, composed of the representative pharmacists of the Northwest, has its headquarters at the College of Pharmacy. About four meetings are held annually. Students of pharmacy are eligible to membership in the branch, but are privileged to attend the meetings without becoming members.

## COMMUNICATIONS

Address communications not relating to registration to the Dean, Professor Frederick J. Wulling, University of Minnesota, Minneapolis, Minnesota.

For further information see General Information bulletin.

# COURSES OF STUDY

Four graded courses are authorized by the Regents leading respectively to the degrees Pharmaceutical Chemist, Bachelor of Science in Pharmacy, Master of Science in Pharmacy, and Doctor of Science in Pharmacy. Only the course leading to the first degree is described in this bulletin, but a limited number of applicants for advanced standing in the courses leading to the second and third degrees will be accepted now. These courses are graded and the lower is a prerequisite for any higher. They cover respectively three, four, five, and six or more years.

## THE REGULAR COURSE

This course now extends over a period of three full University years. The lengthening of the regular course from two to three years has been approved by the Minnesota State Pharmaceutical Association and by the Minnesota State Board of Pharmacy. The curriculum of this course is described in the following pages, but its division among the three years has not been fully decided, except that the work of the first year has been fixed and will include botany, general and qualitative chemistry, beginning pharmacognosy, beginning pharmaceutical subjects and military drill.

## THE FOUR-YEAR COURSE

This course leads to the degree Bachelor of Science in Pharmacy and includes all of the regular three-year course and thirty credits earned in the Arts College, which must include Rhetoric 1 and 2 (six credits), any modern language (six credits), and Principles of Accounting (six credits). The thirty credits may be completed at the convenience of the student, but it is advised that they precede the work in the College of Pharmacy. The degree for this course can not be granted except for four years of work in residence, of which at least the fourth year must be completed at this College.

# DEPARTMENTAL STATEMENTS

## BACTERIOLOGY

Professor H. E. ROBERTSON; Assistant Professor WINFORD P. LARSON; Instructors ARTHUR T. HENRICI, ANNE G. BENTON.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 5b. General | Bacteriology..... | 5 | Sr. | None |

5b. GENERAL BACTERIOLOGY. Preparation of culture media. The morphology of bacteria. Methods of staining and of identification. Anaerobic bacteria. Principles of sterilization and disinfection. Examination of air, water, milk. Relation of bacteriology to the industries. ROBERTSON, LARSON, HENRICI, BENTON.

## BOOK RESEARCH AND SEMINAR WORK

Throughout the year students are required to do book research and seminar work in the pharmaceutical library during certain hours released for the purpose from the pharmaceutical laboratory and other periods. Beginning with the coming year it is proposed to provide regularly in the college schedule two two-hour periods a week during the second semester of the graduating year for this kind of work. A room has been reserved for this purpose in the Pharmacy Building. To make this work of the utmost value the pharmaceutical library is being enlarged.

## BOTANY AND MICROSCOPY

Professors FREDERICK E. CLEMENTS, CARL OTTO ROSENDAHL; Assistant Professors HERBERT F. BERGMAN, FREDERICK K. BUTTERS, NED L. HUFF; Assistant DONALD FOLSOM.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 17. General | Botany..... | 5 | Soph., jr. | None |
| 18. Greenhouse | Work ..... | 1 | Soph., jr. | 17 |

17. GENERAL BOTANY. A study of the external forms of flowering plants with the relations, modifications, and functions of their several organs; special study of the flower with the outlines of the classification of flowering plants. Lectures, laboratory work, and field work. CLEMENTS, ROSENDAHL, BUTTERS, HUFF.

18. GREENHOUSE WORK. The facilities of the greenhouse applied in the study of outer morphology. BUTTERS.

## CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Assistant Professor WILLIAM H. HUNTER; Instructors ROSCOE H. CARTER, WOLF KRITCHEVSKY, WALDEMAR M. STERNBERG, E. K. STRACHAN; Assistant FLOYD E. JOYCE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | General Chemistry | 5 | Soph., jr. | None |
| 3. | Qualitative Analysis | 5 | Soph., jr. | 1 |
| 7. | Quantitative Analysis | 3 | Jr., sr. | 3 |
| 13-14. | Organic Chemistry | 10 | Jr., sr. | 1 and 3 |

1. GENERAL CHEMISTRY. A study of the chemical properties of the non-metallic and the metallic elements. STRACHAN, CARTER.

3. QUALITATIVE ANALYSIS. This course covers the common reactions of the metals and acids and their qualitative separation. The ionic theory and the law of mass action are discussed with especial reference to qualitative reactions. STRACHAN, CARTER.

7. QUANTITATIVE CHEMISTRY. A study of the principles of gravimetric, volumetric, and gasometric estimation. SIDENER, STERNBERG.

111-112. ORGANIC CHEMISTRY. This course includes work in both the aliphatic and aromatic series and the preparation of the more important compounds. HUNTER, KRITCHEVSKY, JOYCE.

## CLINICAL MICROSCOPY

Professor HAROLD E. ROBERTSON; Instructor WILLIAM JOHNSON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Clinical Chemistry and Microscopy | 1 | Sr. | None |

1. CLINICAL CHEMISTRY AND MICROSCOPY. Includes (a) the macroscopic study of urine, its colors, sediments, and finer chemical tests and (b) the microscopic study of urine sediments, blood, pus, epithelial cells, casts, etc. ROBERTSON, JOHNSON.

## DISPENSARY PRESCRIPTION PRACTICE

Instructor OSCAR J. BLOSMO; Assistant JAMES L. TITUS.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-3. | Prescription Practice | 2½ | Jr., sr. | Pharm. 5 |

1-3. DISPENSARY PRESCRIPTION PRACTICE. The prescription dispensing for the Out-Patient Department of the University Hospitals is in charge of the College of Pharmacy. The senior students do the prescription work under competent direction. BLOSMO, TITUS.

## FIRST AIDS TO THE INJURED

Lecturer C. N. McCloud and Assistant.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Emergency Cases | 2/3 | Jr., sr. | None |

2. Emergency Cases. A series of twelve hour lectures and demonstrations designed to qualify the pharmacist to administer upon emergency cases before the arrival of the physician. McCloud.

## MATERIA MEDICA

Professor Wulling; Associate Professor E. L. Newcomb and Assistants.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Inorganic Materia Medica | 2 | Soph., jr. | None |
| 4-3. | Organic Materia Medica | 4 | Soph., jr., sr. | 1 |

1-2. Inorganic Materia Medica. This course runs concurrently and in close relationship with Pharmacy 8 and 11. Wulling.

4-3. Organic Materia Medica. The identity, sources, habitat, family, constituents, and preparations of the U. S. P., and of some unofficial vegetable drugs are studied in this course. Newcomb and Assistants.

## MILITARY DRILL

Professor and Commandant Bernard Lentz; Assistant Commandant and Brigade Adjutant Walter F. Rhinow; Band Instructor Bert Rose.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Military Drill | 1 | Fr. | None |

1-2. Military Drill. Required of all men in the first and second year classes. Students are cautioned to report for the first drill and inform themselves of the requirements of the department.

## PHARMACY

Professor Wulling; Assistant Professor Gustav Bachman; Instructors Oscar J. Blosmo, .....; Assistant D. D. Turner.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | History of Pharmacy | ½ | Soph., jr. | None |
| 3. | Metrology | 3 | Soph., jr. | None |
| 5. | Physics of Pharmacy | 3 | Soph., jr. | 3 |
| 7. | Pharmaceutical Processes | 3½ | Soph., jr. | 5 |

| | | | |
|---|---|---|---|
| 2. Pharmacopoeial Preparations..... | 5 | Soph., jr. | 7 |
| 4. Pharmacy Quiz ..... | 3 | Soph., jr. | 3, 5, 7, 2 |
| 6. Identification Inorganic U. S. P. Preparations ..... | 1 | Soph., jr. | 2 |
| 9. Pharmaceutical Chemical Philosophy ..... | 1½ | Soph., jr. | None |
| 11. The Pharmaceutical Chemistry of the Non-metals ..... | 1½ | Soph., jr. | 9 |
| 8. U. S. P. Inorganic Salts..... | 3 | Soph., jr. | 11 |
| 13. Classification of Pharmaceutical Organic Compounds ..... | 1 | Jr., sr. | 8 |
| 15-16. U. S. P. Organic Compounds and Their Preparations..... | 3 | Jr., sr. | 13 |
| 17. Pharmacopoeial Qualitative Analysis ..... | 5 | Jr., sr. | 11 |
| 18. Pharmacopoeial Quantitative Analysis ..... | 2 | Jr., sr. | 17 |
| 19. Prescription Incompatibility ..... | ½ | Jr., sr. | 9, 13 |
| 21-22. Prescription Dispensing..... | 12 | Jr., sr. | 19, 2 |
| 23. Manufacture U. S. P. Salts..... | 4 | Jr., sr. | 8 |
| 10. National Formulary ..... | 1 | Jr., sr. | 23 |
| 12. Pharmaceutical Assay ..... | 1½ | Jr., sr. | 10 |
| 14. Synthetic Remedies..... | ½ | Jr., sr. | 15 |
| 16. Homeopathic Pharmacy ..... | ½ | Jr., sr. | 21 |
| 25-26. Identification U. S. P. Salts..... | 1½ | Jr., sr. | 8, 15 |
| 18. Microchemistry ..... | .... | ..... | ..... |
| 27-28. Mathematics of Pharmacy..... | 1 | Soph., jr. | 3 |

1. History of Pharmacy. This course embraces the study of the history of pharmacy, including the U. S. Pharmacopoeia through all of its revisions and the literature of pharmacy. Wulling.

3. Metrology. A critical study of weights and measures and balances; specific gravity, specific volume; alligation, etc. Wulling, .....

5. The Physics of Pharmacy. This course covers a review and more extended elucidation of such divisions of physics as apply to pharmaceutical processes. Wulling, ....., Turner.

7. Pharmaceutical Processes. A study of the various laboratory processes employed in pharmaceutical manufacture. .....

2. Pharmacopoeial Preparations. This course includes the study and preparation of official bodies for which the Pharmacopoeia gives formulae and processes. Wulling, ....., Turner.

4. Pharmacy Quiz. A thoro review of the work covered in Courses 3, 5, 7, and 2. Wulling, .....

6. Identification of Inorganic U. S. P. Preparations. The study of the appearance and physical properties of inorganic official preparations. ....., Turner.

9. Pharmaceutical Chemical Philosophy. This course treats of the principles underlying chemistry and elucidates chemical facts and phenomena in their pharmaceutical aspects. Wulling.

11. THE PHARMACEUTICAL CHEMISTRY OF THE NON-METALS. A study of the description, properties, pharmacy, and manufacture of the non-metals used in pharmacy, including their U. S. P. preparations. WULLING.

8. U. S. P. INORGANIC SALTS. Especial reference to sources, description, properties, and manufacture. WULLING.

13. CLASSIFICATION OF PHARMACEUTICAL ORGANIC COMPOUNDS. A preparation for Pharmacy 15-16. WULLING, .....

15-16. U. S. P. ORGANIC COMPOUNDS AND THEIR PREPARATIONS. Includes the critical study of cellulin and its derivatives, destructive distillation products, starches, sugars, fermentation products, organic acids, fixed oils and fats, volatile oils, waxes, and animal fats, alkaloids, glucosides, animal drugs and products, etc. WULLING, .....

17. PHARMACOPOEIAL QUALITATIVE ANALYSIS. A critical study of the identity, purity, limit, and percentage tests of the Pharmacopoeia and their application either wholly or in part to practically every official organic and inorganic salt and compound. BACHMAN, TURNER.

18. PHARMACOPOEIAL QUANTITATIVE ANALYSIS. This course includes the gravimetric, volumetric, and gasometric determinations of the U. S. Pharmacopoeia, but not pharmaceutical assay (12). WULLING, BACHMAN.

19. PRESCRIPTION INCOMPATIBILITY. Therapeutic, pharmaceutical, and chemical incompatibility is taken up in lecture and recitation work preliminary to Course 21-22. BACHMAN.

21-22. PRESCRIPTION DISPENSING. This course runs concurrently and in coöperation with Dispensary Prescription Practice 1, 3, and includes the critical study of the prescription and practical work in dispensing a wide range of prescriptions taken from actual medical practice WULLING, BACHMAN, BLOSMO, TURNER.

23. MANUFACTURE OF U. S. P. SALTS. The preparation of about forty official salts included in this course. WULLING, BACHMAN, TURNER.

10. NATIONAL FORMULARY. This lecture and laboratory course includes a partial study of the National Formulary and the making of a number of its more important preparations. BACHMAN, TURNER.

12. PHARMACEUTICAL ASSAY. The quantitative determination of alkaloidal and other active constituents of a number of the potent organic drugs and preparations. BACHMAN, TURNER.

14. SYNTHETIC REMEDIES. The study of the pharmaceutical chemistry of synthetic chemicals in medical use. WULLING, .....

16. HOMEOPATHIC PHARMACY. A brief exposition of the principles underlying the preparation of homeopathic remedies, including some laboratory work. WULLING, BACHMAN.

25-26. IDENTIFICATION OF U. S. P. SALTS. The study of the physical identity of the more important official inorganic and organic salts. BACHMAN, ....., TURNER.

18. MICROCHEMISTRY. Work in the microchemistry of pharmacy is included in the work of a number of other courses, but will soon be offered as a separate course. WULLING, BACHMAN, NEWCOMB, .....

27-28. MATHEMATICS OF PHARMACY. While students are required to have a preparation in arithmetic, algebra, and geometry before entering, they receive frequent drills throughout the year. Examinations in the subject are required. WULLING, BACHMAN, BLOSMO, .....

## PHARMACEUTICAL JURISPRUDENCE

Professor F. J. WULLING.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Law for Pharmacists..... | 2/3 | Jr., sr. | None |
| 4. | Minnesota Pharmacy Laws..... | 1/3 | Jr., sr. | None |

2. LAW FOR PHARMACISTS. The lectures introduce the subjects of contracts, agency, commercial paper, insurance, etc., in their application to the practice of pharmacy and discuss the liability of retail pharmacists. WULLING.

4. MINNESOTA PHARMACY LAWS. The study of the laws of Minnesota affecting the practice of pharmacy. The lectures are given by special lecturers experienced in the application and operation of the state pharmacy laws.

## PHARMACEUTICAL MINERALOGY AND CRYSTALLOGRAPHY

Assistant Professor FRANK F. GROUT, and Assistant.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 24. | Mineralogy ..... | 1 | Sr., grad. | None |
| 66. | Crystallography ..... | 1 | Sr., grad. | 24 |

24. MINERALOGY. A study of the occurrence and properties of minerals of pharmaceutical importance; ores of metals used in pharmacy; nonmetallic minerals and mineral waters in their mineralogic and geologic relations. GROUT.

66. CRYSTALLOGRAPHY. A survey of form and more evident physical characters as a basis for practice in sight recognition of economic minerals and their distinction from common rocks. GROUT.

## PHARMACOGNOSY

Associate Professor EDWIN L. NEWCOMB and Assistants.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Medicinal Plant Study | | Soph., jr. | None |
| 3. | The Cryptogams | 4 | Soph., jr. | 1 |
| 5-6. | Pharmaco-histology | | Soph., jr. | 3, Mat. Med. 4 |
| 9. | Drug Collection | | Jr., sr. | 5 |
| 11-12. | The Angiosperms | 10 | Jr., sr. | 5 |
| 2. | Field Work | | Jr., sr. | 1 |

1. MEDICINAL PLANT STUDY AND DRUG PREPARATIONS. The principles underlying the preparation of plant drugs, including the study of plants cultivated in the medicinal plant garden, and herbarium work. NEWCOMB and Assistants.

3. THE PHARMACOGNOSY OF THE CRYPTOGAMS. In this course some of the drugs and economic products obtained from the cryptogams are studied. NEWCOMB and Assistants.

5-6. PHARMACO-HISTOLOGY. Includes the micrometry and the detailed study of the inner structure of parts of the higher plants as illustrated by about forty official and unofficial drugs. NEWCOMB and Assistant.

9. DRUG COLLECTION AND PREPARATION. Scientific methods of drug collection and preparation of about fifty drugs from plants grown in the medicinal plant garden. NEWCOMB and Assistants.

11-12. PHARMACOGNOSY OF THE ANGIOSPERMS. Includes the scientific study of the official crude and powdered seeds, roots, rhizomes, barks, woods, pith, flowers, fruits, leaves, herbs, exudations, animal drugs, etc., and their adulteration. NEWCOMB and Assistants.

2. FIELD WORK. The classes are taken on field excursions for native medicinal plants. The study of the distinguishing characteristics of certain orders, families, and genera of medicinal plants is included in this work. NEWCOMB.

## PHYSICAL EDUCATION

### FOR MEN

Director LOUIS J. COOKE; Assistant Director WILLIAM K. FOSTER; Instructor JOHN C. WEST.

The purpose of the department is to provide all men of the University opportunity for exercise in order to maintain and build up their general health. It also provides special training for the correction of physical defects and functional derangements.

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. Students taking the required work in physical education are examined also at the close of the year. A study of these records shows a marked improvement in the standard of health of the average student during his college course.

The gymnasium, swimming pool, and baths are open to all students of the University, who are free to use the apparatus and to pursue a course in physical training under the supervision of the director and his assistants.

Those students taking the required course in physical education who can not swim, must make a reasonable effort, as determined by the department, to pass the swimming and life-saving requirements, and will be assigned special hours for instruction.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Personal Hygiene ..... | None | All | None |

1. PERSONAL HYGIENE. Two hours per week; first six weeks of first semester. Examination at close of course. COOKE.

*A special lecture* on sex hygiene is given sometime during the first ten days of the autumn semester, with required attendance on the part of all freshmen.

## PHYSICAL EDUCATION

### FOR WOMEN

Assistant Professor J. ANNA NORRIS; Instructors MAY S. KISSOCK, ALICE H. TOLG, VALERIA LADD.

This department aims to look after the health of its women students. It gives physical examination and advice to all newly entering students; conducts systematic yearly consultations with and examines, when necessary, all upper class students; gives courses in hygiene; organizes physical work to meet the various needs and physical tastes of students; coöperates closely with the Women's Athletic Association in encouraging and organizing athletic sports; investigates cases of illness in dormitory and boarding houses.

The office is open at regular hours to all students who desire consultation regarding their physical condition.

A new gymnasium building, finished in 1916, affords adequate space and equipment for all activities.

**For further information, see bulletin of the College of Science, Literature, and the Arts.**

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 13. | Personal Hygiene | 3 | Soph., jr., sr. | None |

13. PERSONAL HYGIENE. The essential knowledge of the care of the body, including a brief consideration of its anatomy and a study of its physiology, the prevention of contagious diseases, and first aid to the injured. NORRIS.

## PHYSIOLOGY

Associate Professors RICHARD OLDING BEARD, FREDERICK H. SCOTT; Instructor CHAUNCEY J. V. PETTIBONE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Physiology | 1 | Jr., sr. | None |
| 2. | Urinalysis | 1 | Jr., sr. | 1 |
| 4. | Physiologic Chemistry | 4 | Jr., sr. | 1 |

1. PHYSIOLOGY. The work covers the study of physiological functions and the action of drugs and their effect upon the various systems. BEARD, SCOTT, PETTIBONE.

2. URINALYSIS, QUALITATIVE AND QUANTITATIVE (Postgraduate). Includes the qualitative analysis of representative specimens of urine and the quantitative determination of chlorides, urea, ammonia, total nitrogen, sugar and albumin, together with the preparation of reagents. BEARD, SCOTT.

4. PHYSIOLOGIC CHEMISTRY (Postgraduate). A study of proteids, carbohydrates, fats, muscle, bone, gastric juice, saliva, pancreatic juice, bile, glycogen, blood lymph, chyle, milk. Spectroscopic examination of the blood and the use of polariscope. BEARD, SCOTT.

## THERAPEUTICS AND TOXICOLOGY

Associate Professor EDGAR D. BROWN.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Therapeutics and Toxicology | 2 | Jr., sr. | Pharmacognosy 11 and 12; Mat. Med. 1 |

2. THERAPEUTICS AND TOXICOLOGY. Drugs are studied in groups as governed by their medical and toxic properties. Remedial measures other than those depending upon drugs are fully considered. Poisonous doses of drugs also receive consideration. BROWN.

# STUDENTS

## 1915-16

### GRADUATE STUDENTS—2

Blosmo, Oscar J., Minneapolis
Rogers, Charles H., Morgantown, W. Va

### SENIORS—39

Balzer, Jacob S., Mountain Lake
Beardsley, Lloyd G., New Rockford, North Dakota
Bower, Chauncey C., Wells
Bruce, Hallie F. E., Minneapolis
Cannon, Miles O., Minneapolis
Casey, Roy E., Biwabik
Chan, Thomas F., Alexandria
Cutting, Charles P., Jr., Sleepy Eye
Cycmanick, Jerome E., Wayzata
DeMars, Frank L., Minneapolis
Else, Merle W., Doland, South Dakota
Fournier, Benoit E., Minneapolis
Gauthier, Louis A., Virginia
Gilbertson, Albert T., Minneapolis
Greenwalt, Frances M., Withrow
Gronlund, Emergene L., Tyler
Hermanson, Angeline, Tyler
Hirscher, Alfred M., Janesville
Johnson, Esther C., Minneapolis
Johnson, Frank B., Brainerd
Johnson, Harlan W., Virginia
Kohls, Albert J., New Germany
Larson, Arthur N., Ortonville
Lehman, Edward G., Fairmont
Line, J. E. Hjalmar, Gilbert
Mahoney, James F., Avoca
Maixner, Emil, Owatonna
Rafferty, Frank L., Wabasha
Redfield, Frank L., Cloquet
Robinson, Clayton D., Lake Crystal
Salisbury, David W., Le Sueur
Schmidt, George J., Lake City
Scott, Lloyd H., Eden Valley
Skartum, Reuben W., Lake Benton
Smith, Charles J., Bird Island
Smith, Raymond J., Minneapolis
Stoppel, Albert W., Rochester
Tenhoff, Charles J., Welcome
Witte, Bernard J., Jr., Anoka

### JUNIORS—64

Adler, Birdie H., Rochester
Amberg, Raymond M., Grand Rapids
Bercowitch, Jacob, Minneapolis
Berg, Leonard A., Barron, Wisconsin
Berkuvitz, Benjamin, St. Louis Park
Blanchette, Philip E., Anoka
Bleser, Karl E., Milbank, South Dakota
Carlson, Archie H., Willmar
Carlson, Roy W., Willmar
Caron, Charles L., Faribault
Coughlin, May E., East Scobey, Montana
Distad, G. Raymond, Perley
Eichinger, Howard E., Canby
Elliott, Minnie P., Minneapolis
Flanders, Claire L., Ellsworth, Wisconsin
Fossen, Cora B., Starbuck
Frank, R. Wells, Minneapolis
Gardner, Frances M., Minneapolis
Gotlieb, David P., St. Paul
Hatch, Theodore L., Owatonna
Haugen, Selmer, Henning
Helland, Albert I., Hendrum
Huestis, Russell C., Northfield
Iverson, Ida, Decorah, Iowa
Johnson, Carl E., Lafayette
Johnson, Walter M., New Richland
Knutson, John, Porter
Landru, Norwood G., Hendricks
Larson, Selma, Minneapolis
Layne, George E., Rushford
Lindoo, Earl B., Ladysmith, Wisconsin
Loiselle, Frank P., Deer River
Menzel, Hugo R., Germantown
Metcalf, Olive L., Kimball
Mike, Charles W., Tower
Mulrean, Anna, Minneapolis
Muyres, Frank A., Chaska
Novack, Claude, Minneapolis
Oehlke, E. Werner T., Newport
Oleson, Sydney M., Hutchinson
Olson, Chester J., Dassel
Olson, Silas C., Porter
Petersen, Elmer, Fulda
Peterson, Arthur L. E., Dawson
Peterson, Verner C. J., Minneapolis
Quinn, Charles S., Minneapolis
Reierson, Emmett M., Lake Benton
Rhodes, Fred S., Viroqua, Wisconsin
Shea, Cecil J., Virginia
Stein, Louis, Virginia

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Strimling, Abe, Minneapolis
Strimling, William, Minneapolis
Stucky, Paul H., Waseca
Sugarman, Joseph B., Minneapolis
Sundry, Evans, Zumbrota
Swenson, James C., Mabel
Taylor, Romayne, Minneapolis
Thompson, Arthur, Cyrus
Vaaler, Raymond A., Grand Forks, North Dakota
Vadheim, Peter, Garretson, South Dakota
Vitchenian, Armenag, Constantinople, Turkey
Williams, Harry W., Virginia
Woulfe, Murray, Nassau

# Bulletin of The University of Minnesota

# THE SCHOOL OF CHEMISTRY

## 1916-1917

VOL XIX, NO. 12. JULY 1916

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## 1916

### JULY

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## 1917

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

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| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |

| | | | |
|---|---|---|---|
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 p.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

# THE SCHOOL OF CHEMISTRY

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* Absent on leave, 1916-17.

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* Absent on leave, 1916-17.

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# GENERAL INFORMATION

The School of Chemistry is now housed in the new fireproof laboratory. The building is located on the main axis of the new campus. It contains about one hundred and fifty rooms devoted to various lines of chemical work. The general, qualitative, and quantitative laboratories are of special interest. Each is well equipped and large enough to accommodate approximately six hundred students. There are also organic laboratories, and several suites of rooms devoted to industrial (including photography), technological, and research work. The laboratory contains a good working chemical library and a growing technological museum.

The School of Chemistry offers three courses. Two of these, the Analytical and the five-year course in Arts and Chemistry, offer the student a thoro training in pure chemistry and the allied sciences—aiming to lay a broad foundation for a later more specialized training. They prepare the student for work as a graduate assistant or as instructor in a college, for scientific positions in the state and government service, and for analytical and research positions; the type of position which the graduate is fitted to occupy being dependent upon his personality and ability.

The four-year Analytical Course leads to the degree of Bachelor of Science in Chemistry, while the five-year course leads to the degree of Bachelor of Arts after four years, and Bachelor of Science in Chemistry at the end of the fifth.

The third or Applied Course extends over five years, leading to the degree of Bachelor of Science at the end of four years and Chemical Engineer at the end of the fifth. The course aims to fit the student to take a position in the manufacturing department of a chemical industry, and give him the fundamental knowledge upon which he may build his success. It is becoming more and more the practice in the chemical industries to fill the higher positions from the men who have had a chemical engineering training or its equivalent.

Assistants.—The School of Chemistry now employs nine assistants at $500 per annum, who are supposed to give from 12-15 hours per week to the teaching of chemistry. The object of these assistantships is to provide the departments with efficient assistance, especially in connection with large laboratory classes; and to give the assistants as wide an experience as possible in teaching under competent direction. In addition to the teaching each assistant is expected to pursue some line of research whether or not he is working for a higher degree.

School of Chemistry Society.—The School of Chemistry Society is an organization of students of the school which meets once a month to consider topics of general interest. The society also occasionally procures lecturers to deliver addresses, which are open to the public.

American Chemical Society.—A local section of the American Chemical Society has been organized in Minnesota with headquarters at the University. All students interested are cordially invited to attend its meetings.

The following rule of the College of Science, Literature, and the Arts, applies to candidates for the B.A. degree in the Five-Year Course in Arts and Chemistry: "Requirements for graduation are expressed in credit hours, indicating amount of work; and in honor points, indicating grade of work. Honor points are computed as follows: each credit hour with the grade of A carries three honor points; each credit hour with the grade of B, two honor points; each credit hour with the grade of C, one honor point."

In all these courses a credit is such an amount of work as will require three hours a week of a student's time. One hour of recitation is assumed to require two hours of preparation at home. In the case of laboratory work which does not require outside preparation, three hours of work count for one credit. The credit allowed for lectures varies from one-third to one credit a lecture a week, depending on the amount of outside preparation required of the student for the lecture.

Figures following the descriptive name of a course indicate the number of credits.

## EXPLANATION OF COURSE NUMBERS

Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. The suffixes *a* and *b* apply to one-semester courses offered both semesters, *a* indicating the first semester and *b* the second semester (e.g., 3a,b; 4a,b)

All undergraduate courses are numbered from 1 to 100. All courses open to undergraduates and graduates are numbered from 101 to 200. Strictly graduate courses are numbered from 201 up.

# COURSES OF STUDY

## ANALYTICAL CHEMISTRY

### FRESHMAN YEAR

Chemistry 5-6, General and Analytical, 6
Drawing 21-22, Technical, 4
Mathematics 2a and 9b, Algebra, Trigonometry, and Analytical Geometry, 10
Geology 21, Elements of Mineralogy, 3 (first semester)
*Metallurgy 2, Assaying, 4 (second semester)
Rhetoric 1-2, Rhetoric and Composition, 6
Military Drill, three hours
Physical Education for Men, one hour (first semester only)
or
Physical Education for Women, three hours

### SOPHOMORE YEAR

Animal Biology, 1-2, General Zoology, 6
or
Botany 1-2, General, 6
or
Mathematics 11a and 51b, Calculus, 6
Chemistry 9, Inorganic Preparations, 2 (first semester)
Chemistry 10, Glass Blowing, 1 (second semester)
Chemistry 11-12, Quantitative Analysis, 8
German 1-2 or 5-6 or 21-22, 12 or 6
Physics, 1-2, General, 6
Physics 3-4, Laboratory, 2
Military Drill, three hours

### JUNIOR YEAR

*First Semester*

†Chemistry 15, Photochemistry, 2
Chemistry 23, Iron and Steel Analysis, 2
Chemistry 35, Organic Chemistry, 4
Chemistry 121, Physical, 2
Chemistry 123, Physico-chemical Laboratory, 1

* Women must take Geology 22 instead of Metallurgy 2.

† During the junior and senior years the student, if prepared, has the privilege of specializing for not less than two semesters along one of the following lines: Organic Chemistry, Physical Chemistry, Analytical Chemistry, Applied Chemistry, Phytochemistry, Physiological Chemistry, Geochemistry, Bromatology.

Geology *, General, 3
‡Metallurgy 3, General and Iron, 3

*Second Semester*

Chemistry 106, Mineral and Ore Analysis, 2
Chemistry 36, Organic, 4
†Chemistry 114, Organic Analysis, 3
Chemistry 122, Physical, 2
Chemistry 124, Physico-chemical Laboratory, 1
Chemistry 144, Electrochemistry, 2
‡Metallurgy 4, Wrought Iron and Steel, 3

SENIOR YEAR

*First Semester*

Chemistry 17, Inorganic Colloquium, 2
Chemistry 109, Water Analysis, 1
Chemistry 131, Food Analysis, 2
Chemistry 135, Gas and Coal Analysis, 2
Chemistry 141, Industrial, 3
†Chemistry 143, Sugar, 1
†‡Metallurgy 105, Base Metals, 4
Thesis, 2

*Second Semester*

Chemistry 18, Organic Colloquium, 2
Chemistry 132, Food Analysis, 2
†Chemistry 134, Microchemistry, 1
Chemistry 162, History, 2
†‡Metallurgy 106, Precious Metals, 4
or
Bacteriology 58, General, 4
Thesis, 5

† During the junior and senior years the student, if prepared, has the privilege of specializing for not less than two semesters along one of the following lines: Organic Chemistry, Physical Chemistry, Analytical Chemistry, Applied Chemistry, Phytochemistry, Physiological Chemistry, Geochemistry, Bromatology.

‡ Not open to women. An elective may be taken in any science with the approval of the Student's Work Committee.

## FIVE-YEAR COURSE IN ARTS AND CHEMISTRY

### FRESHMAN, SOPHOMORE, AND JUNIOR YEARS

During the first three years of the course the student is registered in the College of Science, Literature, and the Arts, and subject to its rules. (See Bulletin of the College of Science, Literature, and the Arts.) In or-

der to obtain the degree of Bachelor of Arts at the end of his fourth year and Bachelor of Science in Chemistry at the end of the fifth, he must complete at least ninety credit hours, including fifteen credit hours in starred courses, in the College of Science, Literature, and the Arts during the first three years. These ninety credits must embrace the following subjects and groups of subjects. (For definition of terms and groups, see Bulletin of the College of Science, Literature, and the Arts.)

(1) A minor of at least eighteen credits in Group A of the College of Science, Literature, and the Arts, six credits of this to be Rhetoric 1-2, and at least twelve credits of it to be in German.

(2) A minor of eighteen credits or more in Group B of the College of Science, Literature, and the Arts.

(3) The following courses:

General Chemistry and Qualitative Analysis, or equivalent
Quantitative Analysis, one year
Technical Drawing, 21-22, one year
Geology 21, one semester
*Metallurgy 2 (men) or Geology 22 (women), one semester
Biological Science, one year
General Physics with laboratory work, one year
Mathematics, ten credits
Glass Blowing, one credit

## SENIOR YEAR

During his fourth year he must complete the work required in the junior year of the Analytical Course of the School of Chemistry, and during the four years he must earn 120 honor points (see page 11).

The degree of Bachelor of Arts is voted by the College of Science, Literature, and the Arts at the end of the fourth year, when the student must present a total of not less than one hundred and twenty approved credits, including the two minors above mentioned and at least fifteen credits in courses starred in the Bulletin of the College of Science, Literature, and the Arts. Credits in professional work taken during the fourth year are accepted provided such work has a prerequisite of at least two years of college work.

In this way the student has at the end of the fourth year completed practically all of the required work of the first three years in the School of Chemistry, and also such other work as will enable him to fulfill the requirements for the B.A. degree.

## POST-SENIOR YEAR

The fifth year is the same as the fourth year of the course in Analytical Chemistry, and upon its completion he will be entitled to the degree of Bachelor of Science in Chemistry.

* Not open to women, who will take Geology 22 instead of Metallurgy 2.

## *APPLIED CHEMISTRY

### FRESHMAN YEAR

Chemistry 5-6, General and Analytical, 8
Drawing 1, Freehand (first semester), 1½
Drawing 2, Mechanical (second semester), 1½
Drawing 3 and 4, Descriptive Geometry, 3
Mathematics 2a and 9b, Algebra, Trigonometry, and Analytical Geometry, 10
Geology 21, Elements of Mineralogy, 3 (first semester)
Metallurgy 2, Assaying, 4 (second semester)
Rhetoric 1-2, Rhetoric and Composition, 6
Military Drill, three hours

### SOPHOMORE YEAR

Chemistry 11-12, Quantitative Analysis, 8
Drawing 7-8, Drafting, 4
Mathematics 11a and 51b, Calculus, 6
Mechanical Engineering 1-2, Elementary Shop Practice, 4
Physics 21-22, Elements of Mechanics, 6
Military Drill, three hours

### JUNIOR YEAR

Chemistry 10, Glass Blowing, 1 (second semester)
Chemistry 35-36, Organic, 8
Chemistry 106, Mineral and Ore Analysis, 2 (second semester)
German 1-2 or 5-6 or 21-22, 12 or 6
Physics 161, Electricity and Magnetism, 4‡ (first semester)
Physics 42, Heat, 3 or Physics 162, Electrical Measurements, 3 (second semester)
Mechanical Engineering 3-4, Pattern Making, Foundry and Machine Shop, 6
Mechanical Engineering 15, Mechanism and Kinematics, 4

### SENIOR YEAR

*First Semester*

Chemistry 23, Iron and Steel Analysis, 2
Chemistry 109, Water Analysis, 1
Chemistry 121, Physical, 2
Chemistry 123, Physico-chemical Laboratory, 1
†Geology 1, General, 3

* Not open to women.

† Students wishing to specialize in Electrochemistry, Gas Engineering, or Sugar Technology, may elect special subjects in place of subjects marked thus.

‡ Students not expecting to take Physics 162 in the second semester, may omit the laboratory in Physics 161, and will then receive three credits.

Mechanical Engineering 115, Machine Design, 5
Metallurgy 3, General and Iron, 3

*Second Semester*

Chemistry 122, Physical, 2
Chemistry 124, Physico-chemical laboratory, 1
Chemistry 144, Electrochemistry, 2
†Economics 1b, Elements, 3
Mechanical Engineering 122, Steam Engine, 3
Metallurgy 4, Wrought Iron and Steel, 3
Political Science 1b, American Government, 3

POST-SENIOR YEAR

*First Semester*

Chemistry 135, Gas and Coal Analysis, 2
Chemistry 141, Industrial, 3
Chemistry 143, Sugar, 1
†Elective, 3 or 5
Electrical Engineering 157, Electric Power, 3
Mechanical Engineering 123, Steam Boilers, 1
Thesis, 4 or 2

*Second Semester*

†Chemistry 132, Food Analysis, 3
Chemistry 142, Industrial, 3
Electrical Engineering 158, Electric Power, 3
†Elective, 2 or 3
Political Science 26, Commercial Law, 2
Thesis, 4

† Students wishing to specialize in Electrochemistry, Gas Engineering, or Sugar Technology, may elect special subjects in place of subjects marked thus.

# DEPARTMENTAL STATEMENTS

## CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Associate Professor EVERHART P. HARDING; Assistant Professors IRA H. DERBY, WILLIAM H. HUNTER, EDWARD E. NICHOLSON; Instructors ROSS ALLEN BAKER, FRANK W. BLISS, LILLIAN COHEN, J. GERHARD DIETRICHSON, WOLF KRITCHEVSKY, FRANK H. MACDOUGALL, CARL L. SCHUMANN, WOLDEMAR STERNBERG, EARLE K. STRACHAN, STERLING TEMPLE, H. LEE WARD; Assistants ARTHUR R. CADE, MARTIN B. CHITTICK, ROSCOE H. CARTER, ELMER T. FEGAN, FLOYD E. JOYCE, WALTER M. LAUER, ALLEN I. NEWMAN, S. JOACHIM REICHERT, HUGO RINGSTROM, J. GORDON SWEENEY.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Division of General and Inorganic Chemistry* | | | |
| 1-2. | General Chemistry ..... | 6 | Those entering without Chemistry | None |
| 21-22. | Inorganic and Qual. Chem. | 10 | Those entering without Chemistry | None |
| 3-4. | Adv. Gen. Chem. and Qual. Anal. ..... | 6 | Fr., soph., jr. | Entrance credit in Chemistry |
| 5-6. | Gen. and Anal. Chem..... | 6 | Fr. in Chemistry and Mines | Entrance credit in Chemistry |
| 7-8. | Qualitative Analysis ..... | 6 | Soph., jr., sr. | 1-2 |
| 9. | Inorganic Preparations.... | 2 | Soph., jr. | 3-4, 5-6, 7-8, or 21-22 |
| 10. | Glass Blowing ..... | 1 | Soph., jr. | None |
| 17. | Inorganic Colloquium .... | 2 | Sr. | 11-12 |
| 20. | Teachers' Course ..... | 2 | Jr., sr. | 3-4, 5-6, 7-8, or 21-22 |
| 161. | Chemical Literature ..... | 1 | Sr., grad. | 3-4, 5-6, 7-8, or 21-22, 35-36 |
| 162. | History of Chemistry..... | 2 | Sr., grad. | 35-36 |
| 167-168. | Adv. Inorganic Chemistry. | 4 | Sr., grad. | Two years of College Chemistry |
| 169-170. | Chemistry of the Rare Elements ..... | 4 | Jr., sr., grad. | 11-12 |
| | *Division of Analytical Chemistry* | | | |
| 11-12. | Quantitative Analysis .... | 8 | Soph., jr., sr. | 3-4, 5-6, 7-8, or 21-22 |
| 23. | Iron and Steel Analysis... | 2 | Jr., sr., grad. | 11-12 |
| 25. | Ore and Slag Analysis... | 3 | Sr. in Mines | 23 |
| 106. | Mineral and Ore Analysis. | 2 | Jr., sr. | 11-12 |
| 107-108. | Adv. Quantitative Analysis | 4 or 6 | Sr., grad. | 23 |
| 109. | Water Analysis ..... | 1 | Sr., grad. | 11-12 |

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Division of Organic Chemistry* | | | |
| 18. | Organic Colloquium ..... | 2 | Sr. | 35-36 |
| 35-36. | Organic Chemistry ..... | 8 | Soph., jr., sr. | 3-4 or 7-8 |
| 113. | Toxicology ..... | 2 | Sr., grad. | 35-36 |
| 114. | Organic Analysis ..... | 3 | Jr., sr., grad. | 35-36 |
| 115. | Adv. Organic Chemistry.. | 2 | Sr., grad. | 35-36 |
| 116. | Theoretical Organic Chem. | 2 | Sr., grad. | 35-36 |
| 117. | Coal Tar Dyes..... | 2 | Sr., grad. | 35-36 |
| 118. | Chemistry of the Essential Oils ..... | 2 | Sr., grad. | 35-36 |
| 119. | Chemistry of the Newer Medicinal Compounds... | 2 | Sr., grad. | 35-36 |
| | *Division of Physical Chemistry* | | | |
| 121-122. | Physical Chemistry ..... | 4 | Jr., sr., grad. | 11-12 |
| 123-124. | Physico-chemical Lab. ... | 2 | Jr., sr., grad. | See statement |
| 125-126. | Adv. Physical Chemistry.. | 6 | Sr., grad. | 121-122 |
| 128. | Radiochemistry ..... | 2 | Jr., sr., grad | 7-8 or 11-12 |
| 129-130. | Adv. Physico-chemical Laboratory ..... | 3 to 6 | Sr., grad. | 123-124 |
| 171-172. | Solutions ..... | 4 | Sr., grad. | 121-122, 123-124 |
| 173-174. | Electrochemistry ..... | 6 | Sr., grad. | 121-122, 123-124 |
| | *Division of Technological Chemistry* | | | |
| 27-28. | Chemistry in Every Day Life ..... | 4 | Jr., sr. | 3-4, 7-8 or 21-22 |
| 131. | Food Analysis ..... | 2 | Sr., grad. | 11-12 |
| 132. | Food Analysis ..... | 2 | Sr., grad. | 11-12 |
| 134. | Microchemistry ..... | 1 | Sr., grad. | 11-12 |
| 135. | Gas and Coal Analysis.... | 2 | Sr., grad. | 11-12 |
| 136. | Lubricants ..... | 2 | Jr., sr. | 11-12 |
| 137. | Paint Analysis ..... | 2 | Sr., grad. | 11-12 |
| 138. | Protective Coatings ..... | 2 | Jr., sr., grad. | 35-36 |
| | *Division of Industrial Chemistry* | | | |
| 15. | Photochemistry ..... | 2 | Jr., sr. | 3-4, 5-6, 7-8, or 21-22 |
| 16. | Color Photography ..... | 2 | Jr., sr. | 15 |
| 141. | Industrial Chemistry ..... | 3 | Sr., grad. | 11-12 |
| 142. | Industrial Chemistry ..... | 3 | Sr., grad. | 35-36, 141 |
| 143. | Sugar Chemistry ..... | 1 | Sr., grad. | 35-36 |
| 144. | Electrochemistry ..... | 2 | Jr., sr., grad. | 11-12 |
| 145. | Electric Furnaces ..... | 2 | Jr., sr., grad. | 11-12 |
| 147. | Electrochemical Preparations ..... | 2 | Jr., sr., grad. | 11-12, 35-36 |
| 153. | Elements of Photo-engraving ..... | 2 | Sr., grad. | 15 |
| 154. | Adv. Photo-engraving..... | 2 | Sr., grad. | 153 |
| 155. | Wood Chemistry ..... | 2 | Jr., sr., grad. | 35-36 |
| 156. | Technology of Paper Pulp. | 2 | Jr., sr., grad. | 155 |

## DIVISION OF GENERAL AND INORGANIC CHEMISTRY

1-2. General Chemistry. Includes a study of the metallic and non-metallic elements, with a brief introduction to organic chemistry. Cohen and Assistants.

3-4. ADVANCED GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. Lectures, recitations, and laboratory work. A discussion of the general chemical theories and laws, with qualitative analysis. FRANKFORTER, DIETRICHSON, and Assistants.

5-6. GENERAL AND ANALYTICAL CHEMISTRY. An introduction to descriptive, physical, and metallurgical chemistry and qualitative analysis. TEMPLE and Assistants.

7-8. QUALITATIVE ANALYSIS. Includes the general reactions of the metals and acids with their qualitative separation. Besides this mechanical work, the ionic theory and the law of mass action are discussed with special reference to common qualitative reactions. NICHOLSON, BLISS, and Assistants.

9. INORGANIC PREPARATIONS. The preparation of inorganic salts supplemented by Thorpe's *Inorganic Preparations*. HARDING.

10. GLASS BLOWING. Includes the methods used in the construction and repair of simple glass apparatus. BAKER.

17. COLLOQUIUM IN INORGANIC CHEMISTRY. A systematic review of chemistry. BAKER.

20. TEACHERS' COURSE. Offered to those who are interested in the teaching of chemistry. WARD.

21-22. INORGANIC AND QUALITATIVE CHEMISTRY. This includes a study of the non-metals, metals and qualitative analysis, together with a thoro discussion of the fundamental laws and theories of chemistry. COHEN.

161. CHEMICAL LITERATURE. The course aims to familiarize the students with chemical literature and will include required reading, reports, and bibliographical work. KRITCHEVSKY.

162. HISTORY OF CHEMISTRY. Includes a full discussion of alchemy and chemistry. COHEN.

167-168. ADVANCED INORGANIC CHEMISTRY. Designed to systematize and broaden the student's knowledge of inorganic chemistry. Based largely on Periodic System. Important types of chemical reactions with reference to their analytical and industrial significance. Lectures, recitations, and assigned reading. Two credits a semester. Prerequisite: two years of college chemistry. BAKER.

169-170. CHEMISTRY OF THE RARE ELEMENTS. The descriptive chemistry of the rare elements and their analytical separation. NICHOLSON.

## DIVISION OF ANALYTICAL CHEMISTRY

11-12. QUANTITATIVE ANALYSIS. Includes a general discussion of quantitative methods, with laboratory work in gravimetric analysis, first semester, followed by a discussion of standard solutions and the nec-

essary stoichiometric calculations, with laboratory work in volumetric analysis, second semester. SIDENER, STERNBERG, and Assistants.

23. IRON AND STEEL ANALYSIS. Includes technical methods for the determination of the common constituents of iron ores, iron and steel, with training in rapid work. SIDENER, STERNBERG.

25. ORE AND SLAG ANALYSIS. Rapid technical methods for the determination of certain constituents in ores and slags. STERNBERG.

106. MINERAL AND ORE ANALYSIS. Theory and practice in accurate analysis of silicate rocks, and the rapid determination of certain constituents of ores. SIDENER.

107-108. ADVANCED QUANTITATIVE ANALYSIS. The work in this course will be adapted as far as possible to the needs and desires of the individual student. SIDENER.

109. WATER ANALYSIS. The course includes an exhaustive discussion of the chemical and sanitary properties of water. FRANKFORTER.

DIVISION OF ORGANIC CHEMISTRY

18. COLLOQUIUM IN ORGANIC CHEMISTRY. A thoro quiz in general organic chemistry. FRANKFORTER.

35-36. ORGANIC CHEMISTRY. Includes the aliphatic and the aromatic series. with the preparation of the more important compounds. FRANKFORTER, KRITCHEVSKY, and Assistants.

113. GENERAL TOXICOLOGY. A discussion of the chemistry of the various poisonous compounds, both organic and inorganic; also methods of their isolation from animal tissue, together with tests for same. FRANKFORTER.

114. ORGANIC ANALYSIS. Practice in elementary analysis, determination of special groups, and identification of pure compounds. HUNTER.

115. ADVANCED ORGANIC CHEMISTRY. Selected topics: constitution work, quinones, etc.; the study of organic reactions. HUNTER.

116. THEORETICAL ORGANIC CHEMISTRY. This course will take up theories which apply especially to carbon compounds, such as relation of properties to constitution, carbon valence theory, etc. HUNTER.

117. THE COAL-TAR DYES. The chemistry of the coal-tar dyes and their intermediate products. KRITCHEVSKY.

118. THE CHEMISTRY OF THE ESSENTIAL OILS. A discussion of the constituents of the essential oils, including the terpenes and perfumes. FRANKFORTER.

119. CHEMISTRY OF THE NEWER MEDICINAL COMPOUNDS. Includes a discussion of the chemistry of synthetic organic substances which have medicinal properties. (Continued in Pharmacology second semester.) FRANKFORTER, HUNTER.

## DIVISION OF PHYSICAL CHEMISTRY

121-122. PHYSICAL CHEMISTRY. A consideration of the theories and laws, phenomena and processes which form the basis of chemical science. Charts, models, and experiments are employed to supplement and illustrate the discussions. Open only to those who have had or are taking Course 35-36. DERBY, MACDOUGALL.

123-124. PHYSICO-CHEMICAL LABORATORY. Physico-chemical methods and measurements. Open only to students pursuing Course 121-122, or who have had it or its equivalent. DERBY, MACDOUGALL.

125-126. ADVANCED PHYSICAL CHEMISTRY. The theories of chemistry treated systematically from the standpoint of thermo-dynamics and the molecular theory. Suited to the needs of candidates for the higher degrees and all others interested in the advances of modern physical chemistry. DERBY.

128. RADIOCHEMISTRY. The occurrence, methods of isolation and investigation, and physico-chemical properties of the radioactive substances, together with a brief consideration of the chemical, geological, and biological bearing of the subject. DERBY.

129-130. ADVANCED PHYSICO-CHEMICAL LABORATORY. Advanced measurements in physical chemistry adapted to the desires and qualifications of the individual student. Assigned reading will accompany the experimental work. DERBY.

171-172. SOLUTIONS. A systematic study of the phenomena and theories of solution, including the solution process, diffusion, osmosis, electrical properties, etc., with their various applications to other sciences. DERBY.

173-174. ELECTROCHEMISTRY. The modern theories of solutions and the principles of thermodynamics in their application to electro-chemical energy transformations, electrical quantity, and electro-motive force. MACDOUGALL.

## DIVISION OF TECHNOLOGICAL CHEMISTRY

27. CHEMISTRY IN EVERY DAY LIFE. A discussion of the inorganic substances used in every day life. FRANKFORTER.

28. CHEMISTRY IN EVERY DAY LIFE. A discussion of the organic substances used in every day life. HARDING.

131. FOOD ANALYSIS. Includes the chemical analysis of the various food products and the detection of the common adulterants. HARDING.

132. FOOD ANALYSIS. Continuation of Course 131. HARDING.

134. MICROCHEMISTRY. Includes the precipitation, examination, and identification of minute quantities of substances, and the examination of food materials, fibers, etc., by means of the microscope. HARDING.

135. Gas and Coal Analysis. Comprises the methods of collecting and storing gases preliminary to their analysis; methods of manufacturing commercial gases, their chemical analysis, calorific and photometric; also ultimate and proximate analysis of coals and their calorific determination. Harding.

136. Lubricants. Comprises the chemical and physical examination of oils and greases, and a study of the sources, properties, and uses of lubricants. Two credits, second semester. Bliss.

137. Paint Analysis. Comprises the quantitative separation of pigments and vehicles; a chemical and physical examination of the vehicles; and qualitative and quantitative analyses of the pigments. Harding.

138. Protective Coatings and Bituminous Materials. A study of protective coatings, such as asphalt, and petroleum or tar products—their properties and methods of testing. Mainly laboratory work. Two credits, second semester. Schumann.

## DIVISION OF INDUSTRIAL CHEMISTRY

15. Photochemistry. Includes a discussion of the general principles of photochemistry and their application to dry-plate photography and the ordinary printing processes. Strachan.

16. Color Photography. Theory and practice in the preparation and use of orthochromatic and panchromatic plates; photography in natural colors. Strachan.

141. Industrial Chemistry. Includes the discussion of methods and apparatus used in chemical technology, the testing of commercial chemical products, and excursions. Temple.

142. Industrial Chemistry. Continuation of Course 141. Temple.

143. Sugar Chemistry. Includes the technology of sugar manufacture. Nicholson.

144. Electrochemistry. A discussion of electro-analytical methods and industrial electrochemical processes, with their underlying principles. Dietrichson.

145. Electric Furnaces. Theory and practice in the design, construction, and operation of electric furnaces. Dietrichson

147. Electrochemical Preparations. Theory and practice in the electrochemical preparation of organic and inorganic substances. Dietrichson.

153. Elements of Photoengraving. Includes a study of the preparation of wet plates, zinc etchings, and heliogravures. Strachan.

154. Advanced Photoengraving. Includes the preparation of screen negatives and copper half-tones. Strachan.

155. WOOD CHEMISTRY. Includes a general survey of the chemistry of the carbohydrate group, special attention being given to the resins, the terpenes, cellulose and lignocellulose. FRANKFORTER.

156. TECHNOLOGY OF PAPER PULP. Preparation of the various wood products, as pure cellulose, commercial wood pulp and paper. Special attention will also be given to factory control of these processes. TEMPLE.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. Research Work in Incrganic Chemistry. FRANKFORTER.
203-204. Research Work in Inorganic Chemistry. BAKER.
205-206. Research Work in Inorganic Chemistry. DIETRICHSON.
207-208. Research Work on the Rare Elements. NICHOLSON.
211-212. Research Work in Quantitative Analysis. SIDENER.
221-222. Research Work in Organic Chemistry. FRANKFORTER.
223-224. Research Work in Organic Chemistry. HUNTER.
225-226. Research Work in Organic Chemistry. KRITCHEVSKY.
227-228. Research Work on Oils and Varnishes. SCHUMANN.
231-232. Research Work in Physical Chemistry. DERBY.
233-234. Research Work in Physical Chemistry. STRACHAN.
235-236. Research Work in Physical Chemistry. MACDOUGALL.
241-242. Research Work on Foods. HARDING.
243-244. Research Work on Fuels. HARDING.
251-252. Research Work in Industrial Chemistry. TEMPLE.
253-254. Research Work in Applied Electrochemistry. DIETRICHSON.
255-256. Research Work in Photochemistry. STRACHAN.

## ANIMAL BIOLOGY

Professors HENRY F. NACHTRIEB, CHARLES P. SIGERFOOS; Associate Professor HAL DOWNEY; Instructor GEORGE DELVIN ALLEN.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | General Zoology ..... | 6 | Fr., soph. | None |
| 7-8. | Histology and Embryology... | 6 | Fr., soph. | 1-2 |
| 12. | Histological Technique ..... | 3 | Fr., soph. | 7 |
| 15-16. | General Physiology ..... | 6 | Fr., soph. | 1-2 |

1-2. GENERAL ZOOLOGY. A survey of the animal kingdom, emphasizing the principles of structure, physiology, embryology, classification, and evolution of animals. Textbooks, lectures, quizzes, and laboratory work. SIGERFOOS, ALLEN.

7-8. HISTOLOGY AND EMBRYOLOGY. A comparative microscopic study of the origin and structure of the tissues of vertebrates and invertebrates, and of the organs of mammals. A preparatory course for most of

the advanced courses. Textbook, lectures, and laboratory. DOWNEY and Assistant.

12. HISTOLOGICAL TECHNIQUE. Practical work in the preparation of histological and embryological material. DOWNEY.

15-16. GENERAL PHYSIOLOGY. The functional characteristics of living substance as seen in the cell, tissues, organs, and organisms; theories of the origin of life and death. Textbook, lectures, demonstrations, and laboratory. NACHTRIEB and Assistant.

For other and more advanced courses, see the Bulletin of the College of Science, Literature, and the Arts.

## BOTANY

Professors FREDERICK E. CLEMENTS, CARL OTTO ROSENDAHL, JOSEPHINE E. TILDEN; Assistant Professors HERBERT F. BERGMAN, NED L. HUFF; Instructor WILLIAM S. COOPER; Assistants DONALD FOLSOM, FRANCES L. LONG, HARVEY STALLARD.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | General Botany | 3 | All | None |
| 2. | Structural Botany | 3 | All | 1 or 3 a |
| 4. | Field and Garden Botany | 3 | All | 1 or 3 a |
| | *Intermediate Courses* | | | |
| 7-8. | Taxonomy | 3 or 6 | Soph., jr., sr. | 6 credits; see note under course |
| 9-10. | Physiology and Ecology | 3 or 6 | Soph., jr., sr. | 6 credits |
| 11-12. | Industrial Botany | 3 or 6 | Soph., jr., sr. | 6 credits, including 2 or 3 |

### INTRODUCTORY COURSES

1a,b. GENERAL BOTANY. A study of the external form and organs of flowering plants, root, stem, leaf, fruit and seed, and of their relations to each other, together with simple greenhouse experiments to illustrate the various functions. CLEMENTS, HUFF, BERGMAN, COOPER, FOLSOM, LONG, STALLARD.

2. STRUCTURAL BOTANY. A study of the microscopic structure of flowering plants, the cell, tissues and tissue systems, as seen in the root, stem, leaf, etc. HUFF, STALLARD.

4. FIELD AND GARDEN BOTANY. Greenhouse, garden and field study of the form, behavior, naming, and relationships of flowering plants, together with individual problems in the pollination, reproduction and propagation of common flower types. CLEMENTS, BERGMAN, FOLSOM, LONG, STALLARD.

### INTERMEDIATE COURSES

Either semester of the following courses open to students with the proper prerequisites.

7-8. TAXONOMY. A general study of the classification and relationships of flowering plants. Laboratory and field practice in the determination of species, together with lectures and quizzes. Course 8 (but not 7) open to those who have taken Course 4. ROSENDAHL.

9-10. PHYSIOLOGY AND ECOLOGY. Greenhouse and field study of physical factors and plant responses, absorption, transport, water, loss, nutrition, growth, fertilization, reproduction, and adaptation: field study of habitat, migration, competition, invasion, and succession. CLEMENTS, COOPER.

11-12. INDUSTRIAL BOTANY. Laboratory study of the plants which are useful to man, including those which furnish food, shelter, clothing, etc. TILDEN.

## DRAWING AND DESCRIPTIVE GEOMETRY

Professor WILLIAM H. KIRCHNER; Assistant Professor FRANK B. ROWLEY; Instructors ROBERT W. FRENCH, LYALL DECKER, CHARLES H. BLITMAN.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Engineering Drawing ..... | 3 | Fr. | See statement |
| 3-4. | Descriptive Geometry ..... | 3 | Fr. | See statement |
| 7-8. | Drafting ..... | 6 | Soph. | 1-2, 3-4 |
| 21-22. | Technical Drawing ..... | 4 | All | None |

1-2. ENGINEERING DRAWING. The elements of general drafting. Mechanical drawing as a language. Lines, views, sections, dimensions, standards, signs, abbreviations, explanatory notes. Sketching, lettering, tracing, blue-printing. Representation of detail of machines and structures, and interpretation of working drawings. Open to students in Mathematics 2 and 9 or equivalent. ROWLEY, FRENCH, DECKER.

3-4. DESCRIPTIVE GEOMETRY. First semester: Introductory course; Systems of representation, methods, loci, and constructions. Second semester: Central projection and special cases; representation of lines, planes, and solids, and of their relations; tangencies, intersections, and development; recitations, lectures. Taken concurrently with Course 1-2. Open to students in Mathematics 2 and 9 or equivalent. KIRCHNER, BLITMAN, DECKER.

7-8. DRAFTING. Graphics. Working drawings of machinery. Assembly drawings, outline drawings, diagramatic drawings, lay-out drawings, and detail drawings. Instruction in drafting-room methods and systems. ROWLEY.

21-22. TECHNICAL DRAWING. Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings, and translations. KIRCHNER, FRENCH.

## ECONOMICS

Professors JOHN H. GRAY, E. DANA DURAND; Assistant Professors J. FRANKLIN EBERSOLE, ROY G. BLAKEY, THOMAS WARNER MITCHELL; Instructors LLOYD M. CROSGRAVE, ALBERT C. JAMES, ROBERT J. MCFALL.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *General Courses* | | | |
| 3a,b. | Elements of Economics.... | 3 | Soph., jr., sr. | None |
| | *Production* | | | |
| 2a,b. | Industries and Commerce of the United States ..... | 3 | Soph., jr., sr. | None |
| 13. | Economic Geography of Foreign Countries ..... | 3 | Soph., jr., sr. | 3 credits |
| | *Business Administration* | | | |
| 34. | Business Management ..... | 3 | Soph., jr., sr. | 3 |
| 35-36. | Accounting Principles ..... | 6† | Soph., jr., sr. | None |
| | *Finance* | | | |
| 43a,b. | Banking ..... | 3 | Soph., jr., sr. | 3 |
| 145. | The Modern Business Corporation ..... | 3 | Jr., sr., grad. | 6 credits inc. 3 |
| 146. | Public Utilities ..... | 3 | Jr., sr., grad. | 145 |

† Both semesters must be completed before credit is given for the first semester.

### GENERAL COURSES

3a,b. ELEMENTS OF ECONOMICS. A study of the principles that underlie the present industrial order with reference to present-day economic and social problems. JAMES and Assistants.

### PRODUCTION

2a. INDUSTRIES AND COMMERCE OF THE UNITED STATES. Same as 2b, but given at the College of Agriculture. DURAND.

2b. INDUSTRIES AND COMMERCE OF THE UNITED STATES. Agricultural, mining, and manufacturing industries and internal and foreign commerce. Leading individual industries, geographical distribution, methods of organization, production and marketing, and relationships to one another. Textbook, lectures and assigned readings. DURAND.

13. ECONOMIC GEOGRAPHY OF FOREIGN COUNTRIES. Economic basis of modern civilization; localization of industries; principal extractive, manufacturing, and distributive industries of leading foreign countries, especially markets for American manufacturers. Textbook with lectures and special reports. MCFALL.

### BUSINESS ADMINISTRATION

34. BUSINESS MANAGEMENT. The principles of efficiency in business operation and forms of organization to apply them; the typical departments of a business; their functions, office organization and administration. Textbook, assigned readings, and lectures. MITCHELL.

35-36. PRINCIPLES OF ACCOUNTING. The purpose and principles of account classification; capital and revenue; accruals; valuation; depreciation; preparation and interpretation of balance sheets, income accounts, and other statements; corporation accounts. A laboratory course with supplementary lectures. MITCHELL

### FINANCE

43a,b. PRINCIPLES AND PRACTICE OF BANKING. Contemporary banking institutions, their organization and operation; loans, reserves, note issues, clearing houses, domestic and foreign exchange; the banking systems of foreign countries; and the Federal Reserve banks of the United States. EBERSOLE.

92. STATE AND LOCAL TAXATION. Problems of state and local taxation. Historic survey of various taxes and examination of present procedure in taxing different kinds of property; tax reforms. Particular attention is given to conditions in Minnesota. BLAKEY.

145. MODERN BUSINESS CORPORATION. The organizing, financing, and managing of corporations; the position of the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. GRAY.

146. PUBLIC UTILITIES. Economic and legal bases of classification, the relative advantages of public ownership and regulation. Central and municipal regulation compared. The basis of rates; relative rates; rates and service. Different theories of valuation. GRAY.

## ELECTRICAL ENGINEERING

Professor GEORGE D. SHEPARDSON; Assistant Professor WILLIAM T. RYAN.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 157-158. | Electric Power ..... | 6 | Sr. | Physics 11, 12 |

157-158. ELECTRIC POWER. An elementary study of the electrical problems involved in the generation, distribution, measurement, and utilization of power, supplemented by numerous practical problems. RYAN.

## EXPERIMENTAL ENGINEERING

Professor WILLIAM H. KAVANAUGH; Assistant Professors FRANKLIN R. MCMILLAN, CHARLES FRANKLIN SHOOP; Instructor E. DOW GILMAN.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 101. | Materials Testing Laboratory. | 2 | Jr., sr., grad. | Math. 151 |
| 102. | Steam Laboratory ..... | 2 | Jr., sr., grad. | Math. 152 |

101. MATERIALS TESTING LABORATORY. Investigation of strength and physical properties of various metals and engineering materials, including wood, cement, concrete, ropes, cables, belting, and chains. Supplemented by lectures on the various materials of construction and standard methods of testing. KAVANAUGH, SHOOP, MCMILLAN, GILMAN.

102. HYDRAULIC AND STEAM LABORATORY. Hydraulic measurements. Calibration of weirs, nozzles, orifices, and meters. Tests of water motors, rams; pulsometers; valve setting, indicator practice, calorimetry, study of lubricants, and introductory steam experiments. KAVANAUGH, SHOOP, GILMAN.

## GEOLOGY AND MINERALOGY

Professor WILLIAM H. EMMONS; Assistant Professor FRANK F. GROUT; Instructors A. WALFRED JOHNSTON, TERENCE T. QUIRKE; Assistant THOMAS M. BRODERICK.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | General Geology ..... | 3 | Soph., jr., sr. | None |
| 3. | Laboratory Work ..... | 1 | Soph., jr., sr. | With Course 1 |
| 5. | Economic Geology ..... | 3 | Jr., sr. | 1 |
| 6. | Historical Geology ..... | 3 | Soph., jr., sr. | 1 |
| 8. | Laboratory Work ..... | 1 | Soph., jr., sr. | With Course 6 |
| 21. | Elements of Mineralogy..... | 3 | Soph., jr., sr. | See statement |
| 22. | Descriptive Mineralogy ..... | 3 | Soph., jr., sr. | 21 |
| 65. | Morphology of Minerals..... | 3 | Jr., sr. | 22 |
| 105. | Elements of Rock Study..... | 3 | Jr., sr., grad. | See statement |
| 106. | Petrology ..... | 3 | Jr., sr., grad. | 105 |
| 111. | Ore Deposits ..... | 4 | Sr., grad. | 6, 22, 105 |
| 112. | Problems in Ore Deposits.... | 4 | Sr., grad. | 111 |
| 124. | Structural and Metamorphic Geology ..... | 3 | Sr., grad. | 6, 22, 105 |

1. GENERAL GEOLOGY. A synoptical treatment of materials of the earth and of geologic processes. Physiographic, dynamic and structural geology, with a brief introduction to historical geology. Lectures, laboratory work, field excursions, map study, and conferences. EMMONS, JOHNSTON, QUIRKE.

3. LABORATORY WORK. Supplements Course 1 with study of rocks and ores, topographic and geologic maps, and reference reading. Open only to students taking Course 1. JOHNSTON, QUIRKE, BRODERICK, and Assistants.

5. ECONOMIC GEOLOGY. The mineral resources of the United States. The origin, occurrence, distribution, and uses of the more important

minerals and mineral fuels of economic value. Lectures, map work, conferences and field excursions. QUIRKE.

6. HISTORICAL GEOLOGY. The geological history of the North American continent; the more important types of fossils and their relations. EMMONS, QUIRKE.

8. HISTORICAL GEOLOGY LABORATORY WORK. The interpretation of geologic maps and sections; structural relations; study of fossils and rock specimens. Open only to students taking Course 6. JOHNSTON, QUIRKE.

21. ELEMENTS OF MINERALOGY. The crystal systems; morphological, physical, and chemical character of minerals; occurrence, genesis, and uses of minerals; classification and description of common minerals. Determinative work in laboratory, blowpipe analysis, sight identification. Open to students who have had or are taking Chemistry. BRODERICK.

22. DESCRIPTIVE MINERALOGY. A continuation of Course 21, special attention being given to metalliferous and rock-forming minerals. Laboratory determinations and sight identification. The use of the goniometer and microscope. Laboratory work, reference reading, and field excursions. GROUT, BRODERICK.

65. MORPHOLOGY OF MINERALS. Crystallography, embracing projection and the geometric relations of crystal planes; crystal nomenclature; the relation of optical properties to morphology. A study of crystal models, crystal drawing, identification of minerals from crystal measurements and mathematical calculation. GROUT.

105. ELEMENTS OF ROCK STUDY. The occurrence and genesis of igneous, sedimentary, and metamorphic rocks; their mineral and chemical composition; their structure, texture, and alteration. The classification and methods of identification and description of rocks. Lectures, text, and laboratory work. Open to students who have had Course 1, and who have had or are taking Course 22. GROUT.

106. PETROLOGY. 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. Laboratory work, lectures, and reference reading. BRODERICK.

111. 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. EMMONS.

112. PROBLEMS IN ORE DEPOSITS. Field excursions, map work, lectures on field and laboratory methods. EMMONS.

124. STRUCTURAL AND METAMORPHIC GEOLOGY. The conditions, processes, and results of metamorphism, structural features resulting from deformation under varying conditions of load. JOHNSTON.

## GERMAN LANGUAGE AND LITERATURE

Professor CARL SCHLENKER; Assistant Professors OSCAR C. BURKHARD, WALTER R. MYERS; Instructors JAMES DAVIES, J. THEODORE GEISSENDOERFER, RICHARD WISCHKAEMPER.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Beginning | 12† | All | None |
| 21-22. | Scientific Intermediate | 6† | All | 1-2 or equivalent |
| 5-6. | Prose and Poetry | 6† | All | 2 yrs. prep. German |
| 23-24. | Advanced Scientific Reading. | 6† | All | 3-4 or 5-6 or 4 yrs. prep. German |

† Both semesters must be completed before credit is given for either semester.

1-2. BEGINNING. Pronunciation, grammar, conversation, and composition; selected reading in easy prose and verse. MYERS, DAVIES.

5-6. PROSE AND POETRY. Geography, history, and legend. Review of German grammar throughout the year. Not open to those who have obtained credit in Courses 3-4 or 17-18 or 21-22. This course may be supplemented by Course 27-28. BURKHARD, MYERS, DAVIES, GEISSENDOERFER.

21-22. SCIENTIFIC INTERMEDIATE. This course aims to give students a reading knowledge of German for use in scientific studies. Wait's *German Science Reader* (or equivalent). Not open to those who have obtained credit for Course 3-4 or Course 17-18. May be supplemented by Course 27-28. GEISSENDOERFER.

23-24. ADVANCED SCIENTIFIC READING. Reading of monographs and periodicals. Not open to those who have credit for Course 7-8. May be supplemented by Course 29-30. WISCHKAEMPER.

## MATHEMATICS

Professor GEORGE N. BAUER; Assistant Professor ANTHONY L. UNDERHILL.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2a,b. | Alg. Cont. and Pl. Trig. | 5 | Fr., soph | 1 or prep. Higher Algebra |
| 9a,b. | Pl. and Solid Analyt. Geom. | 5 | Fr., soph., jr., sr | 2a,b, or 4 |
| 11a,b. | Differential Calculus | 3 | Soph., jr., sr. | 7, 9a,b |
| 51a,b. | Integral Calculus | 3 | Jr., sr. | 11a or 11b |

2a,b. ALGEBRA, CONTINUED, THROUGH LOGARITHMS AND PLANE TRIGONOMETRY. Progressions, mathematical induction, determinants, theory of equations, trigonometry. UNDERHILL.

9a,b. PLANE AND SOLID ANALYTICAL GEOMETRY. Rectilinear and polar coördinates, loci and their equations, transformation of coördinates, the straight line, conic sections, higher plane curves, and an introduction to Solid Analytical Geometry. UNDERHILL.

11a,b. DIFFERENTIAL CALCULUS. Differentiation of algebraic and transcendental functions, development of functions, indeterminate forms, maxima and minima, treatment of tangents, sub-tangents, normals, sub-normals, asymptotes, direction and rate of curvature, evolutes, envelopes, and singular points. BAUER, UNDERHILL.

51a,b. INTEGRAL CALCULUS. Integration of the various forms, integration as summation, rectification of curves, quadrature of plane and curved surfaces, cubature of volumes, equations in loci by means of the calculus, successive integration with application to moments of inertia, areas and volumes. BAUER, UNDERHILL.

## MECHANICAL ENGINEERING

Professor JOHN J. FLATHER; Assistant Professors JOHN V. MARTENIS, S. CARL SHIPLEY; Instructors WILLIS W. GRANT, WALLACE H. MARTIN, EDWARD QUIGLEY, WILLIAM H. RICHARDS.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Elementary Shop Practice... | 4 | Fr., soph. | None |
| 3a,b. | Pattern Making and Foundry Practice ..... | 3 | Soph., jr. | 1-2 |
| 4a,b. | Machine Shop Practice..... | 3 | Soph., jr. | 1-2 |
| 15. | Mechanism and Kinematics.. | 4 | Jr. | Math. 11 |
| *115. | Machine Design ..... | 5 | Sr. | Physics 101-102 |
| ‡117. | Machine Design ..... | 3 | Sr. | Physics 101-102 |
| ‡118. | Machine Design ..... | 3 | Sr. | Physics 101-102 |
| 119. | Gas Engines and Producers.. | 3 | Soph. | Chem. 38 or 135 |
| 130. | Steam Engines and Boilers.. | 4 | Jr. | Physics 101-102 |

* Year 1915-16 only.
‡ After 1915-16.

### REQUIREMENTS OF THE DEPARTMENT

Courses offered by the department are arranged in progressive order, and it is essential that subjects be taken in proper sequence. Courses may be elected only by those having sufficient preparation.

1-2. ELEMENTARY SHOP PRACTICE. A general course in shop work, including pattern making, foundry, forge, and machine work. SHIPLEY, RICHARDS, QUIGLEY, GRANT.

3a,b. PATTERN MAKING AND FOUNDRY PRACTICE. An advanced course dealing with patterns for steam and gas engines, machine tool parts, and other special machinery; molding, core making, mixing; brass, bronze, aluminum and grey iron castings; machine molding and special processes. RICHARDS, .....

4a,b. MACHINE SHOP PRACTICE. Machine operations, manufacturing methods and time studies. SHIPLEY, GRANT.

15. MECHANISM AND KINEMATICS. Transmission of motion without consideration of the strength of parts; gears, linkages, screws, epicyclic trains, graphical diagrams of paths, speeds, and accelerations of mechanisms; centroids; cams; roulettes, tooth profiles; kinematic pairs. MARTENIS.

117. MACHINE DESIGN. Calculation and design of such machine parts as fastenings, bearings, rotating pieces, pulleys and spur gearing. Recitations, lectures, and drawing-room practice. FLATHER, MARTENIS.

118. MACHINE DESIGN. Continuation of Course 117. FLATHER, MARTENIS.

119. GAS ENGINES AND PRODUCERS. Principles of operation of gas and oil engines. Application of indicator diagrams. A study of power gas producers of various types; their construction and operation. Recitations and lectures. SHIPLEY, MARTIN.

130. STEAM ENGINES AND BOILERS. Mechanics of steam engine. Steam distribution. Mechanism of steam engine; governing. Steam engine indicator. Compounding. Theory and practice in design of steam boilers, chimneys, boiler settings, and accessories, smoke prevention, mechanical stokers. FLATHER, MARTIN.

## METALLURGY

Professors WILLIAM R. APPLEBY, PETER CHRISTIANSON, LEVI B. PEASE; Assistant Professor SAMUEL L. HOYT.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 2. | Assaying | 4 | Fr., soph. | Geol. 21; Chem. 5 |
| 3. | Gen. Metallurgy and Met. of Iron | 3 | Jr. | Chem. 6 |
| 4. | Met. of Wrought Iron and Steel | 3 | Jr. | 3 |
| 105. | Met. of the Base Metals | 4 | Sr. | 2 |
| 106. | Met. of the Precious Metals | 4 | Sr. | 105 |
| 109. | Electrometallurgy | 3 | Sr. | 2 |
| 153-154. | Metallography | 10 | Sr. | Chem. 6; Physics 1, 2 |
| 160. | Metallography | 3 | Sr. | Chem. 6; Physics 1, 2 |

2. ASSAYING. Determination of values of ores, metallurgical products and bullion. APPLEBY and Assistants.

3. GENERAL METALLURGY AND METALLURGY OF IRON. Including the subjects of combustion, fuels, refractory materials and furnaces. CHRISTIANSON.

4. METALLURGY OF WROUGHT IRON AND STEEL. Consideration of the principles of manufacture, details of plant construction, and chemical and physical phenomena. CHRISTIANSON.

105. METALLURGY OF THE BASE METALS. Lead, copper, zinc, and mercury. Consideration of smelting methods and principles involved in refining methods. PEASE.

106. METALLURGY OF THE PRECIOUS METALS. Gold, silver, and platinum. Methods and principles of cyanidation, chlorination, amalgamation, and lixiviation, as applied to the treatment of the above. PEASE.

109. ELECTROMETALLURGY. A study of reduction of ores, refining of metals, and production of metals by electrolytic deposition; and the use of the electric furnace for smelting of ores, refining metals, and the manufacture of refractory alloys. CHRISTIANSON.

153-154. METALLOGRAPHY. 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; both semesters. HOYT.

160. METALLOGRAPHY FOR CHEMICAL STUDENTS. The preparation of metallic alloys; their microscopical and thermal analysis. Steel and other commercial alloys with particular reference to chemical metallurgy. Corrosion of steel and non-ferrous alloys. Metallography applied to analytical chemistry. HOYT.

## MILITARY SCIENCE AND TACTICS

Professor and Commandant BERNARD LENTZ; Assistant Commandant and Brigade Adjutant WALTER F. RHINOW; Band Instructor BERT ROSE.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Military Drill ..... | None | Fr. | None |
| 3-4. | Military Drill ..... | None | Soph. | 1 yr. Drill |
| 5-6. | Military Drill ..... | 3* | Jr., sr. | 2 yrs. Drill |
| 8. | Military Science ..... | 2† | Jr., sr. | 2 yrs. Drill |

* Not more than a total of six credits is given for elective work in both Military Drill and Physical Education.

† If taken in connection with Course 5-6.

1-6. MILITARY DRILL. Required of all men in the freshman and sophomore classes. Students are cautioned to report for the first drill and inform themselves of the requirements of the department.

1-2. Freshman: Practical instruction in schools of the soldier, company, and battalion; signals, ceremonies; first aid.

3-4. Sophomore: Practical and theoretical instruction in schools in the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

5-6. May be taken voluntarily by others outside of the freshman and sophomore classes. No credit will be allowed for such drill for less than one year.

8. MILITARY SCIENCE. Instruction in advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

## PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

Associate Professor WINFORD P. LARSON; Instructors ARTHUR T. HENRICI and ANNE BENTON.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 58. | General Bacteriology ..... | 4 | All | Gen. Chem. and either Zool. or Bot. |
| 59. | Special Bacteriology ..... | 3 | All | Bact. 58 |
| 104. | Special Bacteriological Technique ..... | 3 | All | Bact. 58 |

58. GENERAL BACTERIOLOGY. Preparation of culture media. The morphology of bacteria. Methods of staining and of identification. Anaerobic bacteria. Principles of sterilization and disinfection. Examination of air, water, milk. Relation of bacteriology to the industries. LARSON, BENTON, HENRICI.

59. SPECIAL BACTERIOLOGY. Study of pathogenic bacteria. Bacteriological methods in clinical diagnosis. Principles of infection and immunity with practical application of serum reactions. LARSON, BENTON, HENRICI.

104. SPECIAL BACTERIOLOGICAL TECHNIQUE. An advanced course offering an opportunity for additional work in bacteriology and affording the opportunity for working out special problems. Limited to ten students. LARSON.

## PHARMACOLOGY

Professor ARTHUR D. HIRSCHFELDER; Associate Professor EDGAR D. BROWN; Assistant Professor ROBERT A. HALL.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 102. | Gen. Pharmacology ..... | 2 | Sr., grad. | Org. Chem. |
| 104. | Experimental Pharmacology | 1½ | Sr., grad. | 102 |
| 113a,b. | Chem. Basis of Pharm..... | 3 | Sr., grad. | Org. Chem. |

102. GENERAL PHARMACOLOGY. The principles underlying the structure, physico-chemical properties, physiologic, therapeutic and toxic actions of substances, natural or synthetic, used as medicines. Fourth year

medical students. At least one semester of physiology is prerequisite. Two credits. HIRSCHFELDER, BROWN.

104. EXPERIMENTAL PHARMACOLOGY. Exercises illustrating the preparation and actions of medicines, their relation to chemical structure and their mode of administration. Fourth year medical students. At least one semester of physiology is prerequisite. One and one-half credits. HIRSCHFELDER, BROWN, HALL.

113a,b. THE PHYSIOLOGICAL AND CHEMICAL BASIS OF PHARMACOLOGY. The relation of drug action to chemical structure; the mode of action and therapeutic application of various synthetic drugs; the study of chemotherapy. An adequate training in chemistry is the one prerequisite. Three credits. HIRSCHFELDER.

For other advanced courses in Pharmacology, consult the Bulletin of the Medical School.

## PHYSICAL EDUCATION

### FOR MEN

Director LOUIS J. COOKE; Assistant Director WILLIAM K. FOSTER; Instructor JOHN C. WEST; Assistant NOAH W. JOHNSTONE.

### GENERAL STATEMENT

The purpose of the department is to provide all men of the University opportunity for exercise to maintain and build up their general health. It also provides special training to correct physical defects and functional derangements.

A physical examination is required at the beginning of the year of all new matriculants and of all others using the department privileges, and as often during their college course as their physical condition may indicate. Students taking the required work in physical education are examined also at the close of the year, and a study of these records shows a marked improvement in the standard of health of the average student during his college course.

The gymnasium, swimming pool, and baths are open to all students of the University, who are free to use the apparatus and to pursue a course in physical training under the supervision of the director and his assistants.

All students are required to pass a first- and a second-semester efficiency swimming test. Those who cannot swim must report to the swimming instructor at the beginning of the first semester and arrange hours at which they can report for instruction until they are able to meet the swimming requirements.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Personal Hygiene ..... | None | All | None |
| 3-4. | Gymnastics ..... | None | Fr. | None |

| | | | |
|---|---|---|---|
| 5-6. Intermediate Gymnastics ... | None | Fr | See statement |
| 7-8. Advanced Leaders ..... | 2† | Soph., jr., sr. | 1, 3-4, 5-6 |
| 9-10. Corrective Gymnastics ..... | None | All | None |
| 10-12. Wrestling ..... | None | Soph., jr., sr. | 3-4 |
| 13-14. Advanced Gymnastics ..... | None | Soph., jr., sr. | 3-4 |
| 15-16. Intermediate Swimming .... | None | All | None |
| 17-18. Advanced Swimming ..... | None | All | 15-16 |

† Both semesters must be completed before credit is given.

1. PERSONAL HYGIENE. Two hours a week; first six weeks of the first semester. Examination at close of course. Open to all. COOKE.

*A special lecture* on sex hygiene is given during the first ten days of the autumn semester, with required attendance on the part of all freshmen.

3-4. GYMNASTICS. Two hours a week, on days not consecutive, from November 1 to end of second semester. Required qualifications in swimming, life-saving, bar-vaulting, jumping, sprinting, running, and on heavy apparatus. COOKE, FOSTER, WEST.

5-6. INTERMEDIATE GYMNASTICS. Three hours a week, on days not consecutive, from November 1 to April 1. Elective for freshmen showing exceptional ability in elementary apparatus work. FOSTER, WEST.

7-8. CLASS LEADERS (Advanced). Three hours a week. (No student may receive more than a total of six credits for elective work in both Physical Education and Military Drill.) FOSTER, WEST.

9-10. CORRECTIVE GYMNASTICS. Three hours a week, on days not consecutive. Special individual courses for students physically defective. To be arranged.

11-12. WRESTLING. Course in competitive wrestling. Most promising candidates chosen to represent Minnesota at the Western Intercollegiate Gymnastic and Wrestling Meet. No credit for gymnasium work is given for this course. (Optional.) FOSTER, WEST.

13-14. ADVANCED GYMNASTICS. Same as Course 11-12 except that it is in gymnastics instead of wrestling. Includes course in ground tumbling, horizontal bar, parallel bars, side horse, and flying rings. FOSTER, WEST.

15-16. SWIMMING, INTERMEDIATE. Life-saving, efficiency swimming, and fancy diving. Instruction is given in rescuing and restoring the apparently drowned and in other useful swimming accomplishments. To be arranged.

17-18. SWIMMING, ADVANCED. To be arranged.

## PHYSICAL EDUCATION

### FOR WOMEN

Assistant Professor J. ANNA NORRIS; Instructors MAY S. KISSOCK, ALICE J. H TOLG, VALERIA LADD.

This department aims to look after the health of its women students. It gives physical examination and advice to all newly entering students; conducts systematic yearly consultations with and examines, when necessary, all upper class students; gives courses in hygiene; organizes physical work to meet the various needs and physical tastes of students; coöperates closely with the Woman's Athletic Association in encouraging and organizing athletic sports; investigates cases of illness in dormitory and boarding houses.

The office is open at regular hours to all students who desire consultation regarding their physical condition.

A new gymnasium building, finished in 1916, affords adequate space and equipment for all activities.

For further information, see bulletin of the College of Science, Literature, and the Arts, and of the College of Education.

## PHYSICS

Professors HENRY A. ERIKSON, ANTHONY ZELENY; Assistant Professor LOUIS W. MCKEEHAN; Instructors ARTHUR H. COMPTON, ERNEST O. DIETERICH, PAUL E. KLOPSTEG.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | General Physics | 3 | Soph., jr., sr. | Math. 2 or 4 |
| 2. | General Physics | 3 | Soph., jr., sr. | 1 or 7 |
| 3. | Gen. Laboratory Practice. | 1 | Soph., jr., sr. | Registration in 1 |
| 4. | Gen. Laboratory Practice. | 1 | Soph., jr., sr. | See statement |
| 21. | Elements of Mechanics | 3 | Fr., soph. | High School Physics & reg. in Math. 1a, 2a or 3a |
| 22. | Elements of Mechanics | 3 | Fr., soph. | 21, Math. 1, 2 or 3, and reg. in Math. 2b, 3b, or 4b |
| 42. | Heat | 3 | Soph., jr., sr. | 2, 8, or 22. Math. 2 or 4 |
| 44. | Heat Measurements | 1 | Soph., jr., sr. | Registration in 42 |
| 52. | Light | 3 | Soph., jr., sr. | 2, 8, or 22, Math. 2 or 4 |
| 54. | Light Measurements | 1 | Soph., jr., sr. | Registration in 52 |
| 125-126. | Chemical Dynamics | 6 | Jr., sr. | 8 & 10 or 12, Math. 51, Chem. 1-2 or 3-4 |
| 155. | Spectrometry | 3 | Jr., sr., grad. | 52 and 82 |
| 161. | Electricity and Magnetism. | 4 | Jr., sr., grad. | 2 & 4, 8 & 10 or 12; Math. 11 |
| 162a,b. | Electrical Measurements | 3 | Jr., sr., grad. | 161 |
| 166. | Electrical Measurements of Precision | 3 | Jr., sr., grad. | 162 |

1. General Physics. Mechanics of solids and fluids, sound, and heat. Treatment experimental rather than mathematical; the fundamental principles. The first part of a general course 1-2. Should be taken in conjunction with Course 3, but may be taken separately. One lecture, two recitations per week. Zeleny, Dieterich, Klopsteg.

2. General Physics. Light, electricity, and magnetism. Treatment experimental; the fundamental principles, including those of radioactivity, ionization, X-radiation, and the electrical constitution of matter. The second part of a general course 1-2. Should be taken in conjunction with Course 4, but may be taken separately. One lecture, two recitations per week. Zeleny, Dieterich, Klopsteg.

3. General Laboratory Practice. Physical measurements in the mechanics of solids and fluids, sound, and heat, giving the student a knowledge of experimental methods, and an acquaintance with the fundamental facts of the subject. McKeehan, Dieterich.

4. General Laboratory Practice. Physical measurements in light, electricity and magnetism. Open to all who have completed or are taking Course 2, and have attended Course 3. McKeehan, Dieterich.

21. Elements of Mechanics. The mechanics of solids treated from an historical and experimental standpoint. Two recitations and one two-hour session in the laboratory per week. Erikson.

22. Elements of Mechanics. The mechanics of liquids and gases, and wave motion, treated from an experimental standpoint. Two recitations and one two-hour session in the laboratory per week. Erikson.

42. Heat. A study of the fundamental principles of heat. One lecture, two recitations per week. Zeleny.

44. Heat Measurements. A laboratory course in heat supplementary to course 42. Zeleny.

125-126. Chemical Dynamics. Designed primarily to meet the needs of students in the School of Chemistry. McKeehan.

161. Electricity and Magnetism. The phenomena accompanying the passage of electricity through solids, liquids, and gases. One lecture, one recitation, and one two-hour laboratory period a week. Zeleny.

162a,b. Electrical Measurement. Devoted mainly to the study of capacity, inductance and magnetic induction. Zeleny, Klopsteg.

*ELECTIVE COURSES

52. Light. A study of the fundamental principles of light. One lecture, two recitations per week. Erikson.

54. Light Measurements. A laboratory course in light supplementary to course 51. Erikson.

* Open to properly qualified students. For other courses, see the Bulletin of the College of Science, Literature, and the Arts.

155. SPECTROMETRY. Measurements involving the use of prism spectroscopes, plane transmission and reflection gratings, concave grating, and the interferometers. ERIKSON.

166. ELECTRICAL MEASUREMENTS OF PRECISION. Making of standard cells, calibration of Wheatstone box bridge; adjustment of resistances, ammeters, and voltmeters; use of the potentiometer; problems involving capacity, inductance, and magnetic flux. ZELENY.

## PHYSIOLOGY

Professor ELIAS P. LYON; Associate Professors RICHARD OLDING BEARD, FREDERICK H. SCOTT; Assistant Professors JOHN F. MCCLENDON, M. RUSSELL WILCOX; Instructors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE; Assistants ROY E. CRUZEN, LYLE J. ROBERTS.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 102. | Physiologic Chemistry ... | 5 | Jr., sr. | Chem. 13 or equivalent |
| 103. | Physiology ..... | 4 | Sr., grad. | 102 and Animal Biology |
| 104. | Physiology of the Nervous System ..... | 4 | Sr., grad. | 103 |
| 111. | Physical Chemistry of Cells | 3 | Sr., grad. | Animal Biology and 2 yrs. of Chemistry |
| 112. | Electrophysiology ..... | 3 | Sr., grad. | As 111 |
| 151-152. | Physiologic Chemistry ... | 3 | Jr., sr., grad. | Chem. 13-14 or equivalent |
| 153-154. | Adv. Physiologic Chem. .. | 3 | Sr., grad. | 102 |
| 161. | Urinalysis ..... | 3 | Sr., grad. | 102 |
| 163. | Metabolism ..... | 1½ | Sr., grad. | 102 |
| 164. | Quantitative Methods .... | 3 | Sr., grad. | 102 |

For a full list of courses in this department see the Bulletin of the Medical School.

102. PHYSIOLOGIC CHEMISTRY. The components of the animal body; foods, digestion, the excreta and metabolism. Third year medical students and others. Prerequisite: organic chemistry one semester. Five credits. PETTIBONE, KINGSBURY, MCCLENDON and Assistants.

103. PHYSIOLOGY OF MUSCLE, NERVE, BLOOD, CIRCULATION AND DIGESTION. Fourth year medical students and others. Prerequisites: physiologic chemistry (102) and animal biology. Four credits. SCOTT, LYON, BEARD, MCCLENDON and Assistants.

104. PHYSIOLOGY OF THE NERVOUS SYSTEM AND SPECIAL SENSES; RESPIRATION, METABOLISM, NUTRITION, AND EXCRETION. Fourth year medical students and others. Prerequisite: course 103. Four credits. LYON, BEARD, SCOTT, MCCLENDON and Assistants.

111. PHYSICAL CHEMISTRY OF CELLS. Osmotic pressure, surface tension and electric conductivity of blood and urine; colloids; permeability of cells and tissues and changes in permeability produced by electrolytes. Prerequisites: animal biology and two courses in chemistry. Three credits. MCCLENDON.

112. ELECTRO-PHYSIOLOGY. The bio-electric currents and the theory of stimulation and narcosis. Hydrogen ion concentration and its relation to enzyme activity and irritability. Prerequisites: animal biology and two courses in chemistry. Three credits. MCCLENDON.

151-152. PHYSIOLOGIC CHEMISTRY. The components of the body, foods, digestion and metabolism. Prerequisite: organic chemistry. Open to qualified students in all divisions of the University. May be taken by medical students in place of course 102. Three credits; in each semester. KINGSBURY and Assistants.

153-154. ADVANCED PHYSIOLOGIC CHEMISTRY. Course arranged by instructors with qualified students for special work. Open to fourth, fifth or sixth year medical students and others; may be taken in either semester or both. Prerequisite: Course 102. Three credits, either semester. PETTIBONE, KINGSBURY.

161. URINALYSIS. Advanced methods. Open to fourth, fifth or sixth year medical and other qualified students. First quarter. Prerequisite: physiologic chemistry (102). One and one-half credits. PETTIBONE.

163. METABOLISM. Special phases of metabolism. Lectures may be taken alone; number of students unlimited; laboratory course limited to ten students. Open to fourth, fifth or sixth year medical students and others. Prerequisites: physiologic chemistry (102). Second quarter. One and one-half credits. PETTIBONE.

164. QUANTITATIVE METHODS. The estimation of certain important substances in the urine, blood and other body fluids. Open to fourth, fifth or sixth year medical students. Prerequisite: Course 102. Three credits. KINGSBURY.

## POLITICAL SCIENCE

Professor WILLIAM A. SCHAPER; Professors CEPHAS D. ALLIN, JEREMIAH S. YOUNG*; Instructor WILLIAM ANDERSON; Assistant PERCIVAL W. VIESSELMAN.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1a,b. | American Government ..... | 3 | Soph., jr., sr. | None |
| 5. | European Municipal Administration ..... | 3 | Soph., jr., sr. | 1 |
| 6. | American Municipal Administration ..... | 3 | Soph., jr., sr. | 1 |
| 7a,b. | State and Local Government. | 3 | Soph., jr., sr. | 1 |
| 26. | Commercial Law ..... | 2 | Sr. | 1 or Econ. 1 |

* Absent on leave.

1a,b. AMERICAN GOVERNMENT. Organization and actual workings of the national government; nature and origin of the American governmental system. SCHAPER, ALLIN, ANDERSON, VIESSELMAN.

5. EUROPEAN MUNICIPAL ADMINISTRATION. A study of French, German, Austrian and English cities; the forms of government, parties and elections; achievements in finance, police, sanitation, city planning and other public services undertaken. SCHAPER.

6. AMERICAN MUNICIPAL ADMINISTRATION. A study of the organization and chief functions of American cities; their growth, relation to the state, forms of charters, inefficiency and corruption, reform measures; and the administration of finance, police, health and other activities. SCHAPER.

7a,b. STATE AND LOCAL GOVERNMENT. A comparison of typical American state governments, with special attention given to Minnesota; relation of the state to the United States and to the local units of government; recent democratic experiments; social and economic legislation. ANDERSON, VIESSELMAN.

26. COMMERCIAL LAW. The principles of law governing ordinary business transactions. This course will deal with the general law of contracts including sales, bankruptcy and agency. VIESSELMAN.

## RHETORIC

Professors JOSEPH M. THOMAS, MARGARET SWEENEY; Assistant Professors DANIEL FORD, SIDNEY F. PATTISON, ANNA H. PHELAN, CHARLES E. SKINNER, HELEN A. WHITNEY; Instructors JAMES T. HILLHOUSE, ARTHUR J. TIEJE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2. | Composition and Rhetoric. | 6 | Fr. | None |
| 1b-2a. | Composition and Rhetoric. | 6 | Fr. | None |
| 11-12. | Exposition, Description, and Narration ..... | 6 | Soph., jr., sr. | 1-2 |
| 15-16. | Exposition and Argument. | 6 | Soph., jr., sr | 1-2 |
| 103-104. | Studies in Structure and Style ..... | 6 | Jr., sr., grad | 1-2, 11-12 or 15-16 |

1-2. COMPOSITION AND RHETORIC. Practical training in the art of writing; the principles of structure and analysis of specimens of good prose. THOMAS, FORD, PATTISON, SKINNER, HILLHOUSE, TIEJE, SWEENEY, PHELAN, WHITNEY.

1b-2a. COMPOSITION AND RHETORIC. Same as Course 1-2.

11-12. EXPOSITION, DESCRIPTION, AND NARRATION. In the first semester the analysis of specimens of exposition; short themes and fortnightly essays, with emphasis on careful planning and amplification. In the

second semester, the same general plan applied to description and narration. Not open to those who have credit for Course 15-16. PATTISON, WHITNEY, PHELAN, SKINNER.

15-16. EXPOSITION AND ARGUMENT. In the first semester, exposition; the second semester, argument. The study of a text and the analysis of specimens, accompanied by weekly essays and shorter themes. Not open to those who have credit for Course 11-12. THOMAS, TIEJE.

103-104. STUDIES IN STYLE AND STRUCTURE. Theory of style and structure; rhetorical analysis of standard English prose; themes based on personal observation, current reading, and investigation; preparation of essays with particular classes of readers in view. FORD.

# Bulletin of The University of Minnesota

# THE COLLEGE OF EDUCATION

## 1916-1917

VOL. XIX. NO. 13. AUGUST 1916

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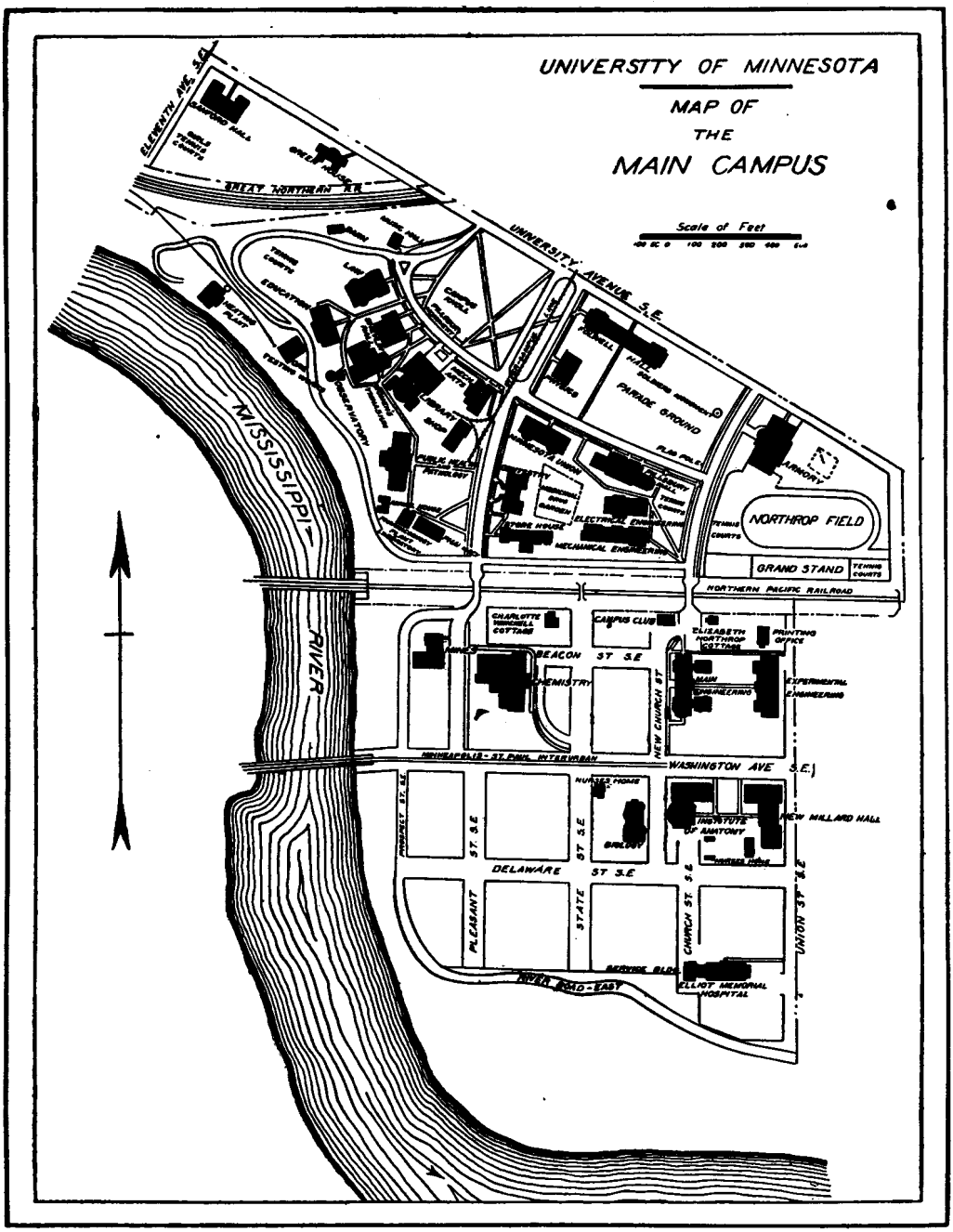
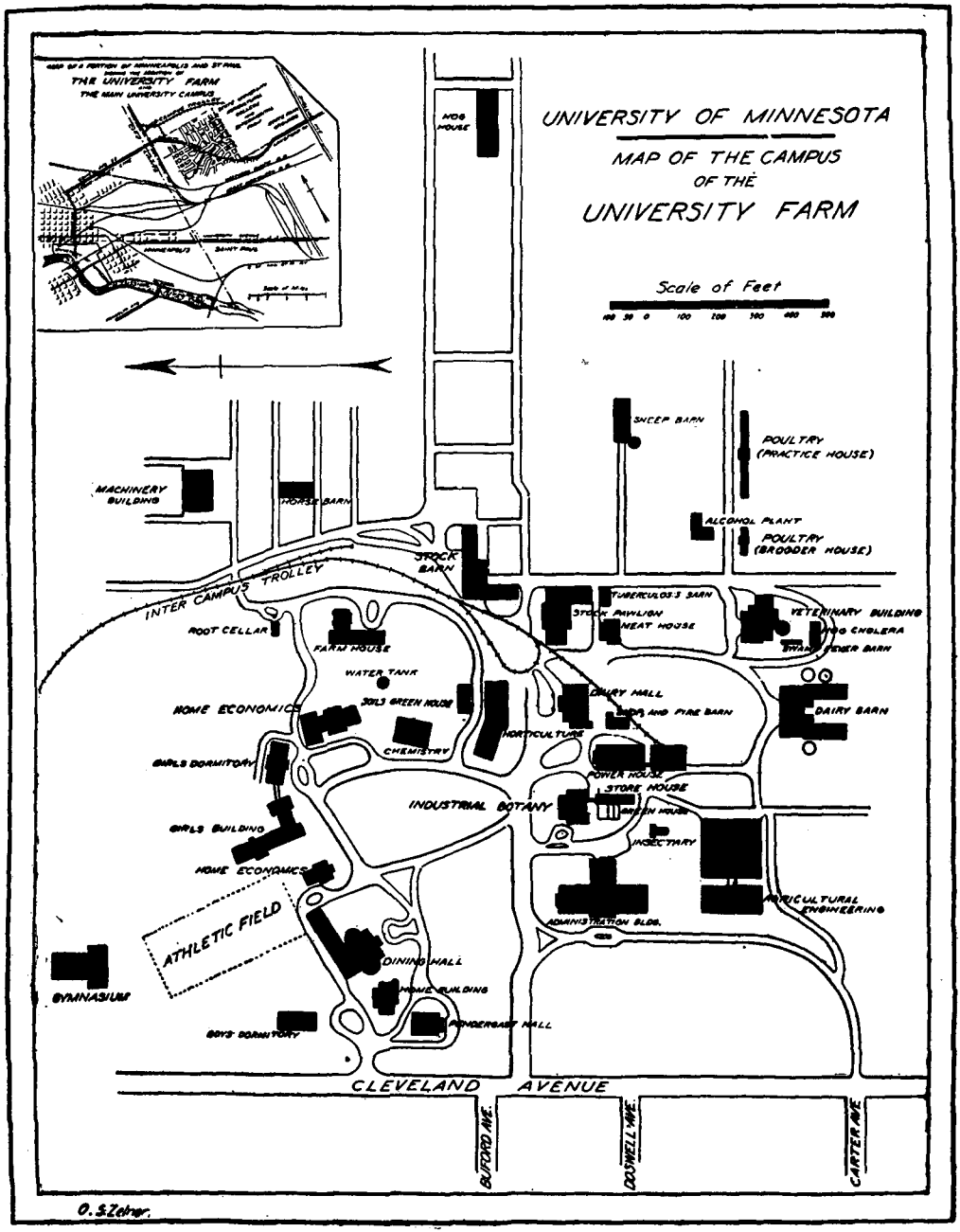



Area of Main Campus, 108.5 acres




Area of University Farm, 422.56 acres

## 1916

### JULY

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## 1917

### JANUARY

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### FEBRUARY

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### JULY

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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# UNIVERSITY CALENDAR

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Examinations for the removal of conditions (except Colleges of Agriculture and Forestry), entrance examinations, registration of new students, and payment of fees. |
| September | 27 | Wednesday | First semester begins |
| October | 2 | Monday | Agricultural College, farm experience examinations |
| October | 2 | Monday | School of Agriculture, first term begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 6 | Monday | Dairy School opens |
| November | 7 | Tuesday | Election day; a holiday |
| November | 22 | Wednesday | Medical School second quarter begins |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 2 | Saturday | Dairy School closes |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m |
| December | 4-9 | Week | Second semester condition examinations, Colleges of Agriculture and Forestry |
| December | 4-9 | Week | Short course for ice-cream makers |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 22 | Friday | School of Agriculture, first term closes |
| 1917 | | | |
| January | 1-6 | Week | Farmers' Short Course |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 3 | Wednesday | School of Embalming begins, eight weeks' session |
| January | 9 | Tuesday | School of Agriculture, second term begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| January | 31 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |

| | | | |
|---|---|---|---|
| February | 5-6 | Monday-Tues. | Registration and payment of fees for new students |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 28 | Wednesday | School of Agriculture closes |
| April | 2-7 | Week | Junior Short Course |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 p.m. |
| April | 11 | Wednesday | Medical School fourth quarter begins |
| April | 16-21 | Week | Condition examinations in certain colleges |
| May | 1 | Tuesday | Traction Engineering Course begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18

# THE COLLEGE OF EDUCATION

## FACULTY

George Edgar Vincent, Ph.D., LL.D., President 1005 5th St. S. E.
Cyrus Northrop, LL.D., President Emeritus 510 10th Ave. S. E.
Lotus D. Coffman, Ph.D., Dean and Professor of Education 1115 E. River Road
Edward E. Nicholson, M.A., Chairman of Joint Administrative Board 914 7th St. S. E.
George N. Bauer, Ph.D., Professor of Mathematics 1201 E. River Road
William O. Beal, Ph.D., Assistant Astronomer 1082 16th Ave. S. E.
Josephine T. Berry, M.A., Professor of Nutrition 2176 Scudder Ave., St. Paul
Gisle Bothne, M.A., Professor of Scandinavian Languages 619 9th Ave. S. E.
Frederick E. Clements, Ph.D., Professor of Botany 508 5th Ave. S. E.
Louis J. Cooke, M.D., Director of Physical Education for Men 909 6th St. S. E.
Hardin Craig, Ph.D., Professor of English 2725 Humboldt Ave. S.
Henry A. Erikson, Ph.D., Professor of Physics 424 Harvard St. S. E.
George B. Frankforter, Ph.D., Professor of Chemistry 525 E. River Road
John Henry Gray, Ph.D., Professor of Economics 412 Walnut St. S. E.
Melvin E. Haggerty, Ph.D., Professor of Educational Psychology 70 Seymour Ave. S. E.
John Corrin Hutchinson, B.A., Professor of Greek 3806 Blaisdell Ave. S.
David L. Kiehle, LL.D., Professor of Education Emeritus 226 58th St. E., Portland, Ore.
William H. Kirchner, B.S., Professor of Drawing and Descriptive Geometry 722 10th Ave. S. E.
Frederick Klaeber, Ph.D., Professor of Comparative Philology 619 9th Ave. S. E.
August C. Krey, Ph.D., Assistant Professor of History 939 14th Ave. S. E.
Winford P. Larson, M.D., Associate Professor of Bacteriology 614 9th Ave. S. E.
Wilfred S. Miller, M.A., Assistant Professor of Education and Principal of the University High School
J. Anna Norris, M.D., Director of Health and Physical Education for Women
Everett Ward Olmsted, Ph.D., Professor of Romance Languages 2727 Lake of the Isles Blvd.
Joseph B. Pike, M.A., Professor of Latin 1025 6th St. S. E.

CHESLEY JUSTIN POSEY, M.S., Assistant Professor of Geography 1627 Melbourne Ave. S. E.
ALBERT W. RANKIN, B.A., Professor of Education 916 5th St. S. E.
WILLIAM A. SCHAPER, Ph.D., Professor of Political Science 625 Fulton St. S. E.
CARL SCHLENKER, B.A., Professor of German 514 11th Ave. S. E.
CARLYLE SCOTT, Professor of Music 3322 Lyndale Ave. S.
CHARLES P. SIGERFOOS, Ph.D., Professor of Zoology
ANDREW A. STOMBERG, M.S., Professor of Scandinavian Languages 531 Walnut St. S. E.
ASHLEY V. STORM, M.A., Professor of Agricultural Education 1827 4th St. S. E.
FLETCHER H. SWIFT, Ph.D., Professor of Education 1910 4th St. S. E.
ARTHUR J. TODD, Ph.D., Professor of Sociology 713 8th Ave. S. E.
JOSEPH M. THOMAS, Ph.D., Professor of Rhetoric 818 Univ. Ave. S. E.
NORMAN WILDE, Ph.D., Professor of Philosophy 901 6th St. S. E.

INSTRUCTORS

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REWEY BELLE INGLIS, B.A., Instructor in Methods of Teaching High School English 2436 Bryant Ave. S.
G. A. MCGARVEY, B.A., Instructor in Manual Training 622 5th St. S. E.
JAMES W. NORMAN, M.A., Instructor in Education
WILLIAM D. REEVE, B.S., Instructor in the Methods of Teaching High School Mathematics 820 University Ave. S. E.

*University High School*

SOPHIA HUBMAN, M.A., Instructor in German
REWEY BELLE INGLIS, B.A., Instructor in English
RAY L. LELAND, B.S., Instructor in History
FRANCES M. MOREHOUSE, A.M., Instructor in History
G. A. MCGARVEY, B.A., Instructor in Manual Training
SAMUEL R. POWERS, B.A., Instructor in Science
WILLIAM D. REEVE, B.S., Instructor in Mathematics
ELSIE M. SMITHIES, B.A., Instructor in Latin

LECTURERS

MABEL CARNEY, Lecturer in Methods of High School Teacher Training Departments
THADDEUS P. GIDDINGS, Lecturer in Public School Music
GEORGIANA LOMMEN, Lecturer in Methods of High School Teacher Training Departments
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# GENERAL INFORMATION

The College of Education was authorized by special enactment of the Legislature of Minnesota in 1905 and was established by the Regents of the University in the following year. It has the following purposes:

1. To offer opportunity for the study of education as an important enterprise of society and as of peculiar interest to all persons whether they are preparing for teaching or not.

2. To offer inexperienced university students who intend to become teachers the technical training for their vocation.

3. To offer experienced teachers or those actively engaged in service opportunity for advanced professional study under direction.

4. To offer to university students, and to all teachers of suitable attainment, appropriate training designed to prepare them for successful careers as public school administrators, normal school teachers, or college teachers of education.

5. To offer opportunity for original investigation, research, and experiments in education and for the preparation of constructive contributions to educational theory and practice.

In fulfilling these purposes the College of Education offers the professional courses for the training of superintendents, principals, supervisors of special subjects, rural school supervisors, teachers of the high school subjects, manual training teachers, school librarians, teachers of high-school teacher-training departments, teachers of agriculture, teachers of home economics, teachers of physical education, supervisors of playground and recreation activities, school nurses, school doctors, and school dentists. The preparation of teachers of home economics and agriculture is given at the College of Agriculture. In every instance the educational courses designed to equip one for work in any one of these special fields is offered by the College of Education, while the subject matter courses are offered by departments in other colleges.

### *University High School*

The University High School and the College of Education are located in the new Education Building. The University High School is maintained, first, to conserve the interests of its student body, and, second, to provide superior opportunities for observation and directed teaching for prospective teachers. To fulfill the latter obligation teachers of recognized skill and proficiency have been engaged as critic teachers. In coöperation with the high school principal, these critics supervise all the practice of the student teachers. For further information consult the Bulletin of the University High School.

### ADMISSION

Students looking forward to teaching should consult with the Dean of the College of Education or the Chairman of the Program Committee early in their course.

Not infrequently seniors discover that a slight difference in arrangement of studies in their course made during their freshman or sophomore years would have made them much more eligible for teaching positions.

Students are held responsible for arranging their courses so as to meet all requirements. To do this intelligently they should secure from the Registrar's office or the office of the Dean of the College of Education the following bulletins and pamphlets:

Bulletin of General Information
Bulletin and program of the College of Education
Bulletin and program of any other college in which subject matter courses are to be pursued
Bulletin of the University High School
Information for New Students
The Minnesota Code
The Minnesota Blue Book
High School Board Rules, State Department of Education, Bulletin No. 45, May, 1915
State Department of Education Bulletin No. 50, March, 1914
See also page 18 of this bulletin.

### *Regular Students*

To be admitted to regular standing in the College of Education, students must be able to satisfy either of the following requirements, (a) or (b).

(a) Completion of at least the freshman and sophomore years of the College of Science, Literature, and the Arts, or of some other approved College at the University of Minnesota or elsewhere, during which time an introductory course in general psychology shall have been pursued. No formal application is necessary for transfer from the College of Science, Literature, and the Arts to the College of Education, nor is any loss of credits involved. Students able to meet the requirements set forth above simply make known their desire at the Registrar's office at the time of registration and they will thereupon be furnished with College of Education registration cards.

(b) Graduation from an approved normal school of Minnesota or of some other state. See below under Advanced Standing.

### *Unclassed Students*

Normal school graduates receiving forty-two credits, teachers preparing for examination for the First Grade Professional Certificate, but who are unable to meet the regular requirements for admission, teachers in service unable to carry full work, and certain other classes of students are admitted to the College of Education as unclassed students. Each case must, however, be dealt with individually as the result of formal application to the Dean.

Unclassed students in the College of Education will find it possible to pursue all subjects required for a First Grade Professional Certificate.

## ADVANCED STANDING

### *By Examination*

The tendency of the College of Education is distinctly toward discouraging any effort to secure advanced standing in professional subjects by examination. With the establishment of correspondence courses in the General Extension Division, there are no longer the reasons which formerly existed for granting such examinations. (See also statement, Practice Teaching, page 21.)

### *Graduates of Minnesota Normal Schools*

The College of Education grants to graduates of the Advanced Graduate Course of Minnesota State Normal Schools sixty credits of advanced standing (approximately two years' credit); to graduates of the Advanced Latin or Advanced English courses, forty-two credits.

Normal School graduates desiring admission to the College of Education must present a recommendation from the President of the normal school from which they were graduated, together with a record of the courses pursued and grades received.

Students admitted to the College of Education from normal schools will not be permitted to elect the following courses for credit: Education 1; Philosophy 1-2, or 5; Rhetoric 1-2; History 1-2.

For a statement of records to be submitted, see Bulletin of General Information, pages 25-26.

## CLASS ROUTINE AND SCHOLASTIC REQUIREMENTS

The following regulations refer chiefly to undergraduates; graduate students should consult the bulletin of the Graduate School.

Classes are held mornings and afternoons of every week day except Saturday afternoon. (For teachers' afternoon and Saturday classes see page 17.)

No student may elect work during any semester in more than five departments. Students must elect at least fourteen hours a week. Students may ordinarily elect not more than seventeen credit hours. A student who has, during the preceding semester or two semesters, earned an average of one and one-half honor points for each credit hour taken and who has had no condition or failure the preceding semester, may elect eighteen hours, upon the approval by the Administrative Board of a petition for permission to do the same. For explanation of Credit Hours and Honor Points, see page 14.

Students whose absences exceed four weeks in the aggregate during a semester are not permitted to take the semester examinations without permission of the Administrative Board. Any student reported below grade in sixty per cent of his work, or in three subjects, at the middle or close of the first semester or middle of the second semester is dropped from the rolls and not allowed to re-enter the University until the opening of the following year.

Examinations are held at the close of each semester. A student's grade is based upon his class work and examination. Four passing grades are given, namely A, B, C, D. Work not done satisfactorily is marked I (incomplete), E (condition), or F (failure). An incomplete must be removed within one month after the opening of the following semester; otherwise it becomes a condition.

A failure must be removed by pursuing the work again in class the next time the course is offered.

## CERTIFICATES

### *Required in Minnesota*

Every teacher in the Minnesota Public Schools must have a valid certificate before he can be lawfully employed. Two classes of certificates are of interest to University students:

1. A First Grade Professional Certificate renders its holder eligible for the following positions: (1) Superintendent of Schools (if candidate has had previously two years' experience in supervising grades); (2) Principal of a Graded or High School; (3) Instructor in any high-school subject, except those subjects which demand special certificates.

2. A Special Certificate authorizes the holder to teach the special subjects indicated on the certificate. The University prepares students for special certificates in: (1) Music; (2) Drawing; (3) Home Economics; (4) Manual Training; (5) Agriculture; (6) Commercial Subjects; (7) Public School Music; (8) Physical Education; (9) School Doctors; (10) School Nurses; (11) School Dentists.

3. High School Training and Teacher-Librarians. In addition to the courses preparing for special certificates, the College of Education offers courses to prepare teachers for high-school rural training departments and high-school teacher-librarians. The State Department issues no special certificates for these two classes of teachers, but gives an official endorsement to students who complete these courses in the College of Education. The College of Education grants persons completing these courses a special diploma.

### *The University Teachers' Certificate*

1. Two year certificate. The University Teachers' Certificate is valid for two years as a First Grade Professional Certificate. Holders are eligible for all positions open to holders of the First Grade Professional Certificate named above. The courses leading to this certificate are described on page 20.

2. Life Certificates. After two years of successful teaching experience, the University Teachers' Certificate may become a Life Certificate, upon endorsement by the State Department of Education and the President of the University. This two-years' experience must be gained within Minnesota. Graduates who teach in another state may, upon returning to Minnesota, apply to the State Department of Education for an extension of their University Teachers' Certificate for two years at the

completion of which application may be made for a permanent life certificate. The fee for this extension is $1. Holders of the University Teachers' Certificate who wish to have their certificate made a permanent life certificate should apply directly to the State Department of Education, St. Paul, for a permanent endorsement of the certificate. The fee for this endorsement is $5.

*Regulations Governing the Issuance of Certificates*

1. All inexperienced students desiring the University Teachers' Certificate (described on page 12) are required to comply with the University requirements for this certificate. This certificate shall specify the major and minor subjects the student is qualified to teach.

2. Mature and experienced undergraduates may petition the Administrative Board to be excused from certain of the prescribed courses for the regular University Teachers' Certificate, but their petition must be approved by the Department of Education and the petition must be accompanied by a statement showing that the student has been a successful teacher in certain high school subjects. These students will be required to complete satisfactorily prior to graduation at least fifteen hours of work in education. The education courses which they shall be privileged to carry will be determined entirely upon the recommendation of the Dean of the College of Education or the Department of Education.

3. Graduates of normal schools or of other institutions registered in the College of Education who do not desire to become high school teachers, but who desire a more liberal training for elementary school work, may be relieved from complying with the regular requirements for a University Teachers' Certificate, but they will not be relieved from carrying at least fifteen hours of work in education. Such persons at graduation will be granted a special teachers' certificate describing their courses and indicating the types of positions for which they are qualified.

4. Students desiring to qualify as public school administrators will be granted a certificate upon completion of a course leading to such a certificate, but no student shall be eligible to such a certificate unless he has completed at least twenty-four hours of work in education, at least twelve of which must have been taken at the University of Minnesota.

5. Teachers and supervisors of public school music, of physical education, of manual training, of home economics, of agriculture, and of such special subjects as may later be included in the program of the College of Education will be granted a special teacher's or supervisor's certificate upon completing a prescribed course leading to such a certificate.

6. Students desiring to qualify as heads of teachers training departments in high schools will be granted a certificate upon the completion of a course leading to such a certificate.

7. Students desiring to qualify as teachers of defective or super-normal children will be granted a certificate upon completion of a course leading to such a certificate.

8. School doctors, school dentists, and school nurses will be granted

a special certificate upon completion of courses designed to prepare for these special kinds of educational work.

9. Students regularly enrolled for graduate work with education as a major shall, upon the completion of the requirements for an advanced degree, be recommended for a University Teachers' Certificate.

10. Students regularly enrolled for graduate work with education as a minor, who desire a University Teachers' Certificate shall be required to complete the course prescribed for such a certificate, unless they have already met the requirements or their equivalent for the certificate in their undergraduate carcers.

## THE DEGREE OF BACHELOR OF ARTS (IN EDUCATION)

The degree of Bachelor of Arts (in Education) may be conferred by the College of Education upon any student who fulfills all the requirements stated below.

### *Summary of Requirements*

1. Amount and grade of work. During his entire course the student must earn: (a) one hundred and twenty credit hours in addition to the required exercises in drill, gymnasium, and physical education; (b) one hundred and twenty honor points; (c) one and one-half honor points per credit hour in his major subject.

2. Courses required and allowed. (a) The student must have completed (normally during sophomore year) a general introductory course in psychology (e.g. Philosophy 1-2, or 5, or an equivalent of the same); (b) he must have satisfied all the requirements for a teachers' certificate (see page 20) except as hereinafter provided:

(1) Students *already holding a first grade professional certificate will be excused from complying with the university requirements for the certificate,* but they will be required to carry an equivalent number of courses in education.

3. Distribution of work—Majors and Minors. A student must take a sufficient number of courses so distributed among at least three distinct departments concerned with the work of the secondary school as to secure one major and two minors. Either Education or Psychology may be counted as a major or a minor in this group.

4. Residence. At least thirty credits must be earned by residence in this college. If the term of residence is only one year, that year must be the senior year; and in any case, at least half of the work of the senior year must be done in residence. Attendance at summer sessions counts as residence.

### *Explanation of Requirements*

The amount of work pursued by a student is estimated in credit hours; the quality or grade of his work, in honor points.

A *Credit Hour* is one hour per week of recitation or lecture work extending throughout one semester, or three hours per week of laboratory work through one semester. It is assumed that each credit hour

will demand on the average three hours a week of the student's time for recitation or lecture, one hour in class and two hours of preparation; for laboratory courses, three hours in the laboratory.

*Honor Points* are computed as follows: each credit hour with the grade of A entitles the recipient to three honor points; each credit hour with the grade of B entitles the recipient to two honor points; each credit with the grade of C to one honor point; each credit hour with the grade of D to no honor points. Illustration: A student completing a one-semester three-credit course and receiving the grade A would be entitled to nine honor points; if receiving the grade B to six honor points; if receiving the grade C to three honor points; if receiving the grade D to no honor points.

*Major and Minors.* Twelve credits is the minimum requirement for a minor and eighteen credits for a major, in the College of Education. Usually a minor will demand from fifteen to eighteen credits with a corresponding increase for the major, depending upon the combination which the student has selected with a view to future teaching. Only in special cases will the minimum mentioned above be accepted. The definite determination of the credits required is left in each case to the department concerned, for a statement of which consult the departmental statements appearing further on in this bulletin.

## GRADUATION WITH DISTINCTION

The degree of Bachelor of Arts in Education with Distinction is granted to graduates of this College who fulfill the following conditions:

A. Special excellence in major subject.

B. Application for the degree with distinction should be made at the time of entering the College, but may, however, be postponed until the opening of the senior year.

C. At the time of application the student shall, after conference with the Dean of the College of Education, or some other member of the Faculty appointed for that purpose, select a subject for his thesis, which must be formally approved and recorded.

D. The presentation of a satisfactory thesis upon some subject within the major field of study not later than May 1, senior year.

E. At the time of application the student must have an average of one and one-half honor points per credit hour in all previous work.

F. At the time of graduation the student must have met all conditions applying to the Bachelor's Degree in Education; must show a record of one and one-half honor points per credit hour in *four-fifths of all work pursued throughout his entire course*; and

G. Must be recommended to the Faculty for the degree with distinction, which recommendation must be approved by the vote of the Faculty of the College.

## GRADUATE WORK IN EDUCATION

*Graduate Study.* Graduate courses in Education leading to the degree of Master of Arts or Doctor of Philosophy may be pursued in the

Graduate School. Students who desire to undertake graduate work in Education must have had at least a year's work in Psychology and in addition to this, a total of not less than twelve credits in Education. Graduates, holding a Bachelor's degree, who have less than twelve credits in undergraduate courses in Education, will be obliged to increase the number of credits required for a major or a minor in Education by the difference between twelve and the number of undergraduate credits in Education which they present. Such students will not, however, be debarred from counting all the time spent at the University toward satisfying the residence requirement of graduate work, provided the work which they pursue is approved by the Dean of the Graduate School.

During summer session graduate work may be pursued. The Master's degree may ordinarily be completed in four summer sessions. For full statement of regulations, consult Graduate School Bulletin.

### TEACHING ASSISTANTS IN MINNEAPOLIS PUBLIC SCHOOLS

The College of Education in coöperation with the Minneapolis schools has adopted a plan which provides for employing in the Minneapolis high schools a certain number of University graduates to be known as "teaching assistants." The adoption of this plan is in essence the establishment in the Minneapolis public schools of a certain number of teaching fellowships for graduate students. These teaching assistants will receive a compensation for their work in the schools proportionate to the amount of time devoted to teaching; $300 for the first year; $400 for the second year.

For each assistant a definite course, combining graduate professional study and teaching experience will be outlined. Altho the plan provides an abundance of teaching experience, the greater emphasis will be thrown upon advanced professional study.

*Work in Minneapolis Schools.* Teaching assistants shall be on duty at the schools from 8:30 until 12:15. Their work will be divided between teaching and assisting. During their first year they shall instruct not more than two classes per day, that is, one-third of a regular teacher's teaching periods. If they continue a second year, the portion of their time devoted to class instruction may be increased to three periods a day. Their work as teaching assistants shall be limited to the hours during which they are on duty in the schools and no additional work other than preparation for teaching their regular courses shall be required of them outside of the above set schedule of hours.

*Applications for positions* as teaching assistants should be made directly to the principal of the University High School. The number of such positions cannot be absolutely determined in advance of the opening of the Schools.

### COÖPERATION WITH STATE DEPARTMENT OF EDUCATION

Arrangements have been made whereby a few students of superior ability who are interested in problems relating to the administration of

state systems of education may carry on a limited part of their work in the office of the State Superintendent of Education. This office now has at its command a very valuable library, a great mass of original material, and the services of a number of competent men and women who are devoting themselves to the administration and supervision of:

(a) The description of state's moneys for the support of public education.

(b) The inspection of rural, elementary, and secondary schools.

(c) Construction of buildings.

(d) The training of teachers.

It is understood that in case any students are recommended for this work, the recommendation must be made by the Department of Education of the University of Minnesota, and that such students, in case they are to receive credit for graduate work in the University of Minnesota, will be expected to work under the supervision of the State Department of Education and the Department of Education in the University of Minnesota and that in each instance, the student will be required to do a specific and intensive piece of work.

## SPECIAL OPPORTUNITIES FOR TEACHERS IN SERVICE

Afternoon and Saturday morning classes, correspondence lessons, extension classes, and the summer session are the chief channels through which the College of Education seeks to discharge its obligation to teachers in service.

### *Afternoon and Saturday Classes*

A special announcement of late afternoon and Saturday morning classes arranged especially for teachers, together with a statement of the requirements for admission and method of registration will be issued by the College of Education early in September.

### *Teacher Training through Extension Courses*

The General Extension Division offers excellent opportunities for teachers and others to pursue courses carrying credit for the Bachelor of Arts degree or for the professional state teachers' certificate, either by correspondence lessons or by joining an extension class. For further information address the General Extension Division, University of Minnesota.

### *Summer Session*

The summer session conducted by the University offers unusual opportunities for professional training to undergraduates, graduates, superintendents and principals, teachers in service, and candidates for first grade and second grade State Professional Certificates. The summer session of 1917 will begin Monday, June 18.

## EMPLOYMENT BUREAUS

*Appointment Bureau.* The University of Minnesota maintains an Appointment Bureau which endeavors to place graduates of the University of Minnesota in positions best suited to their training and experience. Students looking forward to teaching should register during the first semester of their senior year. No fee, however, will be charged to those who register before February 15. Complete instructions and registration blanks should be secured at the office of the Appointments Bureau. During the year 1916-17, the general office of this Bureau will be located in the College of Education Building, Room 103. Special offices, however, will be maintained at the College of Agriculture under the direction of Professor A. V. Storm for those desiring to teach agriculture or domestic science.

*State Teachers' Employment Bureau.* The State Teachers' Employment Bureau, located in the State Capitol, St. Paul, under the direction of Mr. E. T. Critchett, offers its services to all teachers and prospective teachers. The fee for registration is $3.

Neither the University of Minnesota nor the State Teachers' Employment Bureau exacts any commission.

# COURSES OF STUDY

## DEPARTMENT

Every course listed in this Bulletin counts in the College of Education.

## GUIDANCE IN THE SELECTION OF COURSES

### *Superintendents and Graded School Principals*

It is probable that in the near future the State High School Board will require that prospective superintendents and principals of graded schools who have not had at least two years' experience in a supervisory position in a school of at least two departments shall, before entering upon their duties, have had courses in School Administration and School Supervision in some recognized normal school or college, totaling at least five semester credits. The following courses will be credited toward this requirement: 109, 121, 123, 124, 134, and 141. Course 121 is a general introduction to all other courses in School Administration and is especially recommended to those beginning a study of this field.

### *Graduate Students*

All courses bearing number of 100 and above are open to graduate students. Before attempting to make out their programs, graduate students in Education should consult the Dean of the College of Education and the Dean of the Graduate School. Attention is called to the fact that Course 125 is ordinarily required of all candidates for advanced degrees. Courses bearing numbers 200 and above are open to graduate students only.

All graduate students majoring in Education are required to meet with the department staff every alternate Monday evening from 7:15 to 9:00 for conference regarding subjects of original investigation. This work carries no credit. See also pages 15-16 of this bulletin.

### *Candidates for State Professional Certificate*

Unclassed students, candidates for the State Professional Certificate, may pursue courses in residence or by correspondence or in extension classes. For guidance in the selection of courses relating to this certificate, consult statement, State Professional Teachers' Certificate, page 12.

### *Undergraduates*

Students should consult carefully the departmental descriptions of courses required for admission to teachers' course. The teachers' course in each subject must be taken in advance of or contemporaneously with practice teaching. For some subjects more than a minor is required for admission to teachers' courses in the case of students who wish to offer the subject only as a minor.

See the following topics in this bulletin: (1) University Teachers' Certificate, page 12; (2) major and minors, page 14; (3) special training courses, page 21-24; (4) admission, page 9; (5) prerequisites for teachers' courses, page 21.

## THE UNIVERSITY TEACHERS' CERTIFICATE

A two-year, junior-senior course, leading to the degree of Bachelor of Arts (in education) entitles the recipient in every case to a University Teachers' Certificate.

All students without teaching experience, desiring a University Teachers' Certificate will be required to comply with the requirements listed below. Such students will also be required to complete a two years' course leading to the degree of Bachelor of Arts (in Education).

Candidates for this degree may major in any department offering work in the College of Education.

Recipients of the degree of Bachelor of Arts (in Education) and of the University Teachers' Certificate may, by a proper selection of studies during their regular course, become eligible for recommendation or endorsement for one of the special certificates described on pages 13-14.

### *Prescribed Course of Study for University Teachers' Certificate*

The College of Education has adopted the prescribed course of study outlined below, for the University Teachers' Certificate, and for the degree of Bachelor of Arts (in Education).

| No. | Title | Credits | To be Taken Semester | Year |
|---|---|---|---|---|
| 1. | Brief Hist. of Educ. ..... | 3 | 1 or 2 | Jr. |
| | or | | | |
| 101-102. | History of Education..... | 6 | 1 and 2 | Jr. |
| 3. | Social Aspects of Educ..... | 3 | 1 or 2 | Jr. |
| 11. | Technique of Teaching..... | 3 | 1 or 2 | Sr. |
| 115. | Practice Teaching ..... (See statement below) | 3 | 1 or 2 | Sr. |
| | Teachers' Courses (i.e. courses in special methods covering at least two high school subjects and totaling at least three credits*. | 3 | 1 or 2<br>or 1 | Jr.<br>Sr. |

A general introductory course in Psychology is a prerequisite for all courses in Education, except those now offered in the Department of Agricultural Education and in the Department of Home Economics Education. Credits gained by it, however, are not counted as professional credits toward the teachers' certificate.

* In some cases the amount of work necessary to meet this requirement will total six credits. In other cases a single teachers' course totaling only three credits is arranged in such a way as to cover two subjects, thereby satisfying this requirement. An example of this is the teachers' course in English and Rhetoric.

*Graduates of normal schools* who, upon entering the College of Education, receive credit for any of the courses specified above will be allowed to elect in the place of the same other strictly professional subjects.

### PRACTICE TEACHING—PREREQUISITES

Opportunity for Practice Teaching is provided in part by the University High School and in part by the Minneapolis City Schools.

Education 1 or 101-102, 3, 11, and the teachers' course in the department in which the student wishes to do practice teaching, together with all subjects required by the department concerned as prerequisite to the teachers' course (see departmental statement) are prerequisite to the course in Practice Teaching. In cases where the teachers' course extends throughout two semesters, students will in exceptional cases be permitted to do their practice teaching during the second semester of their teachers' course.

### ADMISSION TO PRACTICE TEACHING

#### *Application and Credentials*

No student will be permitted to do practice teaching who has not been definitely recommended by the department in which the subject lies as being well prepared from the standpoint of subject matter.

All assignments to Practice Teaching are made by the Principal of the University High School. Before registering for this work students must consult with him and submit: (1) the departmental recommendation referred to above and (2) a statement from the Registrar showing the courses they are offering as prerequisites including, (a) the courses in Education, (b) the courses in the department concerned. This statement must show when these courses were taken and the grade received and it must be followed by a formal statement that the student has satisfied all the prerequisites for practice teaching. Special blanks for this purpose may be secured at the office of the High School Principal.

Students at the College of Agriculture desiring to qualify as teachers will be required to comply with the usual requirements for practice teaching. Arrangements for this work will be made by Professor Storm and Miss Berry.

*Credits allowed in Agriculture and Home Economics.* A maximum of eighteen credits is elective from courses in Agriculture and Home Economics, but it should be noted that prospective teachers of these subjects must secure from the State Department of Education in advance of their contract to teach, a special certificate in the subject concerned.

## SPECIAL TRAINING COURSES

### DEPARTMENT OF AGRICULTURAL EDUCATION

The special professional courses offered by the College of Education for the preparation of teachers, superintendents, and supervisors of agriculture are given in the Department of Agricultural Education on the campus of the College of Agriculture. (See department statement, page 31.)

## COMMERCIAL TRAINING

The demand for University graduates as commercial teachers has been greater than the University has been able to meet. A new requirement of the State Department that teachers of commercial subjects, must be college graduates will intensify this demand. The University has as yet made no arrangements to offer the technical subjects required for this work, such as stenography, typewriting, penmanship, bookkeeping, etc. Nevertheless, by a proper selection of courses in English, rhetoric, foreign language, history, economics, psychology, and education, students who have secured a knowledge of the technical subjects elsewhere can get a broad and sound foundation for this work during their university course.

## DEPARTMENT OF HOME ECONOMICS EDUCATION

The special professional courses offered by the College of Education in Home Economics for the training of teachers of Home Economics are given by the Department of Home Economics Education on the campus of the College of Agriculture. (See department statement, page 32.)

## MANUAL TRAINING

During the year 1914-15 the course for preparing manual training teachers was reorganized and placed upon a more substantial basis. Still further progress has been made for the year 1916-17.

Students looking forward to teaching manual training may, under the present arrangements, offer manual training as a minor in the College of Education. Under manual training in the departmental statement will be found a prescribed course of study to be required of all students whom the College of Education will recommend for certificates as teachers of manual training. (See department statement, pages 33-34.)

## TEACHER-LIBRARIANS

Owing to the existence of a large number of small high schools, and to a recent ruling of the State High School Board made in 1915, which requires every state-aided high school to provide trained service for the high school library, there will undoubtedly be an urgent and increasing demand during the next few years for teachers who have had some definite library training and who will divide their time between teaching and the care of the school library. The College of Education will offer during the year 1916-17, under the direction of Miss Martha Wilson, State Supervisor of School Libraries, a brief course for training high school teacher-librarians. Those who complete the three courses named below will receive three credits in the College of Education and a teacher-librarian certificate from the Department of Education.

These courses extend over two years and will be confined to Saturday mornings. Course 1 will be offered the first semester of 1916-17; course 4, the second semester of 1916-17; course 2, the second semester of 1917-18.

Students who begin library training the first semester of their junior year will be able by the end of their senior year to have satisfied the requirements for work as high school teacher-librarians. Students beginning the first semester of their senior year may complete their training by pursuing the course in the summer school.

For description of courses, see departmental statement, page 35.

### HIGH SCHOOL TEACHER-TRAINING DEPARTMENTS

The College of Education offers a definite course of study for the preparation of teachers for high school teacher training departments. This course is open only to teachers who have had two years of rural teaching experience and who in addition to this are graduates from the advanced course of a Minnesota State Normal School or who possess equivalent professional preparation.

NOTE: To this second requirement exceptions may be made in the case of teachers already engaged in high school training departments and in certain other individual cases where circumstances justify the same.

In the conduct of the course the College of Education will be assisted by Miss Mabel Carney, State Supervisor of Teachers' Training Departments, who will offer a course of monthly lectures and conferences extending throughout the year. The courses in the methods of teaching the elementary studies will be in the hands of teachers actually engaged in High School Training Departments.

Ordinarily two years will be required to complete this course. However, teachers already engaged in high-school training departments and holding First Grade Professional Certificates and who are unable to absent themselves from their duties for more than a year will be permitted to deviate from the prescribed course of study and to elect such subjects as will be of most immediate use to them in their work.

Students who complete the course offered by the College of Education for teachers of training departments will be eligible for the endorsement of the State Department of Education as heads of training departments in high schools. The course as outlined (see pages 36-37) provides Education as a major study, with Economics and English as minors. The selection of these two subjects as minors has been based upon the nearness of their relation to the work of the rural school teacher. The Education courses are all required, but other minors may be selected upon approval. The attention of teachers desiring to become teachers in high school training departments is called to the following rules recently passed by the High School Board which provides that after 1918 all candidates for this work shall be both normal school and college graduates.

### TEACHERS OF DEFECTIVES

During the past year the College of Education, in coöperation with the department of Psychology, has been able to prepare a limited number of teachers of mental defectives. Plans are now in progress for a further development of this phase of teacher preparation and it is hoped that it may prove possible in the near future to organize effective train-

ing courses for teachers of the blind, and the deaf and dumb, as well as for teachers of mental defectives. Students interested in preparing for this type of work should consult with the Dean of the College.

### KINDERGARTEN AND ELEMENTARY TEACHERS

The College of Education offers opportunity for advanced study to teachers who have had adequate normal school training and who wish to take further preparation for work as principals, supervisors, or teachers of elementary schools. A special certificate will be granted to normal school graduates who spend two years in the College of Education taking advanced work for the purpose of becoming better teachers of elementary schools. The following agreements between the presidents of the State Normal Schools of Minnesota and the Executive Faculty of the College of Education, reached at an informal conference, April 3, 1915, make it possible for students in the College of Education, who discover during their course that their taste and ability lie in the elementary field, to transfer from the College of Education to one of the normal schools at the opening of their senior year and thus prepare themselves as elementary teachers or as kindergarteners without loss of time.

*Agreements between Normal Schools and College of Education*

1. That less than one year of residence at a State Normal School for the purpose of preparing for kindergarten or elementary school work would not be adequate.

2. That the normal schools would be willing to confer their regular diploma upon university students coming to them from the College of Education, who had had three years of college work, upon the satisfactory completion of one year in the normal schools.

3. That these provisions be limited to students previously registered in the College of Education.

4. That they should not apply to students who had entered the College of Education upon the basis of normal school credits.

### PUBLIC SCHOOL MUSIC

See courses 27-28 under statement of Department of Music.

### SCHOOL NURSES, SCHOOL DOCTORS, SCHOOL DENTISTS

The demand for school nurses, school doctors and school dentists is increasing. Special courses will be arranged for persons desiring to qualify for any of these types of work.

# DEPARTMENTAL STATEMENTS

## EDUCATION

Professors LOTUS D. COFFMAN, MELVIN E. HAGGERTY, ALBERT W. RANKIN, FLETCHER H. SWIFT; Assistant Professor WILFRED S. MILLER; Instructors CHARLES L. HARLAN, REWEY BELLE INGLIS, G. A. MCGARVEY, JAMES W. NORMAN, WILLIAM D. REEVE; Assistant HARRY N. FITCH; Scholar JOSEPH J. WEBER; Special Lecturers MABEL CARNEY, THADDEUS P. GIDDING, CHARLES H. KEENE, GEORGIANA LOMMEN, JULIUS P. SEDGWICK, MARTHA WILSON.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor*, eighteen credits, including Philosophy 1-2, or equivalent.

*For a Major*, twenty-four credits, including Philosophy 1-2, or equivalent. Six credits in Psychology are prerequisite for all courses in Education.

### COURSES

| No. | Credits | Title | | | Offered to | Prereq. courses |
|---|---|---|---|---|---|---|
| 1a | 3 | Brief Course in Hist. of Educ. | | | Jr., sr. | Phil. 1-2 |
| | | 8 | TThS | | 205Ed | Swift, Norman |
| | | 9 | TThS | | 205Ed | Swift, Norman |
| | | 8 | MWF | | 205Ed | Swift, Norman |
| 1b | 3 | Brief Course in Hist. of Educ. | | | Jr., sr. | Phil. 1-2 |
| | | 9 | TThS | | 205Ed | Swift, Norman |
| | | 10:45 | TThS | | Col. of Agr. | Norman |
| 3a | 3 | Social Aspects of Educ..... | | | Jr., sr. | Phil. 1-2 |
| | | 4 | MWF | | 204Ed | ..... |
| 3b | 3 | Social Aspects of Educ..... | | | Jr., sr. | Phil. 1-2 |
| | | 8 | MWF | | 204Ed | Rankin |
| 3bt | 3 | Social Aspects of Educ..... | | | Teachers | Phil. 1-2 |
| | | 8-9:50 | S | | 206Ed | Rankin |
| 11a | 3 | Technique of Teaching..... | | | Jr., sr. | Phil. 1-2 |
| | | 8 | MWF | | 206Ed | Haggerty |
| | | 9 | MWF | | 206Ed | Coffman |
| 11b | 3 | Technique of Teaching..... | | | Jr., sr. | Phil. 1-2 |
| | | 9 | MWF | | 205Ed | Norman |
| 101 | 3 | Hist. Foundations of Mod. Ed. | | | Jr., sr., grad. | Phil. 1-2 and 6 cr. in Dept. of History |
| | | 4-5:30 | TTh | | 205Ed | Swift |
| 102 | 3 | Hist. of Educ. Since Reform. | | | Jr., sr., grad. | Phil. 1-2 and 6 cr. in Dept. of History |
| | | 4-5:30 | TTh | | 205Ed | Swift |
| 103 | 2 | Educational Classics ..... | | | Jr., sr., grad. | 1 or 101-102 |
| | | 3 | TTh | | 205Ed | Swift, Norman |
| 104 | 2 | Educational Classics ..... | | | Jr., sr., grad. | 1 or 101-102 |
| | | 3 | TTh | | 205Ed | Swift, Norman |
| 105 | 3 | Educational Psychology ..... | | | Sr., grad. | Phil. 1-2 |
| | | 11 | MWF | | 206Ed | Haggerty |
| 106 | 3 | Educational Psychology ..... | | | Sr., grad. | Phil. 1-2 |
| | | 11 | MWF | | 206Ed | Haggerty |

| | | | | | |
|---|---|---|---|---|---|
| 107-108 | 0 | Problems in High School Training Departments ..... | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | M | 205Ed | Carney |
| 109 | 2 | Educational Diagnosis ..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 10-11:40 | S | 206Ed | Haggerty |
| 115a | 3 | Practice Teaching ..... | | Sr., grad. | See statement |
| | | Ar | Ar | Ar | Miller |
| 115b | 3 | Practice Teaching ..... | | Sr., grad. | See statement |
| | | Ar | Ar | Ar | Miller |
| 119 | 3 | School Curricula ..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 4 | MWF | 206Ed | Rankin |
| 121a | 3 | School Organ. & Admin..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 3 | MWF | 206Ed | Rankin |
| 121b | 3 | School Organ. & Admin..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 2 | MWF | 206Ed | Rankin |
| 123 | 3 | Theory of Supervision..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 11 | MWF | 205Ed | Coffman |
| 124 | 3 | Educational Administration .. | | Sr., grad. | 121 |
| | | 3 | MWF | 111Ed | Coffman |
| 125 | 3 | Methods in Educ. Research.. | | Sr., grad. | 1 or 101-102 and 3 |
| | | 3 | MW | 111Ed | Coffman |
| 131 | 3 | German Schools ..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 10 | TThS | 205Ed | Norman |
| 132 | 3 | French Schools ..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 10 | TThS | 205Ed | Norman |
| 134 | 2 | Mental Diagnosis ..... | | Sr., grad. | Phil. 1-2 |
| | | 10-11:40 | S | 206Ed | Haggerty |
| 136 | 3 | Mental Tests ..... | | Jr., sr., grad. | Phil. 1-2 |
| | | 2-4 | MWF | 202Ed | Haggerty |
| 141 | 3 | School Sanitatn. & Pub. Health | | Sr., grad. | 1 or 101-102 and 3 |
| | | 8 | MWF | 204Ed | Rankin |
| 142 | 3 | Industrial Education ..... | | Sr., grad. | 1 or 101-102 and 3 |
| | | 4 | MWF | 206Ed | Rankin |
| 146 | 3 | Hist. & Prin. of Religious Ed. | | Jr., sr., grad. | Phil. 1-2 |
| | | 4 | MWF | 205Ed | Swift |
| 152 | 1 | Elem. Methods in Reading... | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | Th | 102Ed | Lommen |
| 153 | 1 | Elem. Methods in English.... | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | Th | 102Ed | Harlan |
| 154 | 1 | Elem. Methods in Indus. Arts. | | Jr., sr., grad. | 1 or 101-102 |
| | | Ar | Ar | Col. of Agr. | Lommen |
| 155 | 1 | Elem. Methods in History.... | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | T | 102Ed | Lommen |
| 156 | 1 | Elem. Methods in Geography.. | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | T | 102Ed | Lommen |
| 157 | 1 | Elem. Methods in Arithmetic. | | Jr., sr., grad. | 1 or 101-102 |
| | | Ar | Ar | Ar | Harlan |
| 201-202 | 2 | Seminar in Selected Problems in Educational History ..... | | Grad. | 101-102 and 6 cr. in Dept. of History |
| | | 4-5:30 | W | 214Ed | Swift |
| 203-204 | 2 | Seminar in Educ. Psychology. | | Grad. | 105 |
| | | 4-5:30 | M | 207Ed | Haggerty |
| 205-206 | 2 | Seminar in Educational Adm.. | | Grad. | 124, 125, 126 |
| | | 4-5:30 | W | 203Ed | Coffman |

## HISTORY OF EDUCATION

1a or 1b. A BRIEF COURSE IN THE HISTORY OF EDUCATION. Current school problems and educational theories in the light of their history. Emphasis upon secondary education and those aspects of education of most immediate concern to high-school teachers. SWIFT, NORMAN.

101. FOUNDATIONS OF MODERN EDUCATION. An interpretative historical study of those elements in modern education derived from the Hebrews, Greeks, Romans, Middle Ages, and Renaissance. Emphasis will be laid upon secondary and higher education and the origin and results of the monopoly of the cultural conception of education and cultural studies. SWIFT.

102. HISTORY OF EDUCATION FROM THE REFORMATION TO THE PRESENT TIME. Modern educational institutions, theories, and problems in the light of their history. Special emphasis upon elementary education SWIFT.

103. EDUCATIONAL CLASSICS. An intensive study of selected writings of educational leaders, from Locke to the present time. SWIFT, NORMAN.

104. EDUCATIONAL CLASSICS. An intensive study of selected writings of educational leaders, from Locke to the present time. SWIFT.

201-202. SEMINAR IN SELECTED PROBLEMS IN EDUCATIONAL HISTORY. Research work for graduate students. SWIFT.

## PRINCIPLES OF EDUCATION

11a or 11b. TECHNIQUE OF TEACHING. Types of classroom exercises; preparation of teaching plans; hygiene of instruction; classroom management; the professional ethics of teaching; observation of high-school work. COFFMAN, HAGGERTY.

## EDUCATIONAL PSYCHOLOGY

105 EDUCATIONAL PSYCHOLOGY: MENTAL DEVELOPMENT. The origin and nature of the human organism, the origin, development, and control of instincts, and the relation of instincts to the formation of habits, individual differences, their nature, extent, and causes. An advanced course. HAGGERTY.

106. EDUCATIONAL PSYCHOLOGY: THE PSYCHOLOGY OF LEARNING. Methods of measuring the rate of learning; study of typical learning experiments and an examination of the conditions of the most economic learning, and the psychology of the school subjects. HAGGERTY.

109. EDUCATIONAL DIAGNOSIS. A study of educational scales and standard tests for the measurement of efficiency in school subjects. The course will deal with the nature of the tests, the methods of their use and an analysis of results obtained. HAGGERTY.

134. MENTAL DIAGNOSIS OF SCHOOL CHILDREN. A study of mental variation in children, its nature, degree, causes, and effects and a discus-

sion of methods of treating superior and subnormal individuals in the schools. HAGGERTY, KEENE, SEDGWICK.

136. MENTAL TESTS. Study of individual differences by means of mental tests. Laboratory work in giving and taking tests, introductory to the use of group tests for the measurement of age-level, etc. HAGGERTY.

203-204. SEMINAR IN EDUCATIONAL PSYCHOLOGY. A research course for graduate students. Problems in educational psychology. HAGGERTY.

## PSYCHOLOGICAL CLINIC

Beginning with the school year 1916-17, a psycho-educational clinic will be opened at Millard Hall in coöperation with the Medical School and the Department of Sociology. The physical and medical examinations will be given under the direction of Professor J. P. Sedgwick; the sociological study will be directed by Professor A. J. Todd and mental examinations will be in charge of Professor M. E. Haggerty. Opportunity will be given in this clinic for the study of mental deviation. It is proposed to make adequate diagnosis of super-normal and normal as well as sub-normal individuals, and students in Educational Psychology will be expected to familiarize themselves with the work of the clinic.

## SCHOOL ADMINISTRATION

3a or 3b. SOCIAL ASPECTS OF EDUCATION. The school as a community factor; the present peculiar relation of the school to social problems; the function of the school in these relations. RANKIN, .....

3bt. SOCIAL ASPECTS OF EDUCATION. Same as above for teachers. RANKIN.

107-108. PROBLEMS OF THE HIGH SCHOOL TRAINING DEPARTMENT. Lectures and conferences upon the problems of high-school teacher-training departments. No credit. CARNEY.

119. SCHOOL CURRICULA. The curriculum as related to social, industrial, and economic conditions; a survey of the grammar grades and of the high school. Consideration of the possibilities of developing a curriculum better adapted to community needs. RANKIN.

121a. SCHOOL ORGANIZATION AND ADMINISTRATION. An introductory course in school administration for students of teaching experience and for those looking forward to work as principals and superintendents. RANKIN.

121b. Same as 121a. RANKIN.

123. THEORY OF SUPERVISION. The problems involved in the training of teachers in service; studies of qualities of merit in teachers; factors in service; factors in selecting teachers; the distribution of subject matter by grades; time allotment of studies. COFFMAN, .....

124. EDUCATIONAL ADMINISTRATION. The interpretation of present ten-

dencies in the administration of state and city school systems. COFFMAN, .....

125. METHODS IN EDUCATIONAL RESEARCH. A study of statistical and other methods as applied to educational investigation. This course is ordinarily required of all candidates for advanced degrees. COFFMAN.

205-206. SEMINAR IN EDUCATIONAL ADMINISTRATION. COFFMAN.

SCHOOL SANITATION AND HYGIENE

141. SCHOOL SANITATION AND PUBLIC HEALTH. A course in school hygiene in its broader aspects. Designed for all teachers and supervisors who are responsible for the health of school children. Treats of medical supervision and other problems arising from school environment.

FOREIGN SCHOOLS

131. GERMAN SCHOOLS. Study of the existing school systems of Germany and with emphasis upon present conditions and problems. NORMAN.

132. FRENCH SCHOOLS. A study of the existing school systems of France with emphasis upon present conditions and problems. NORMAN.

RELIGIOUS EDUCATION

146. HISTORY AND PRINCIPLES OF RELIGIOUS EDUCATION. Part I: The influence of religion and religious education as social and spiritual forces among certain selected types. Part II: Principles of education as applied to religious instruction and training. This course may be pursued as a graduate course under certain conditions. SWIFT.

PRACTICE TEACHING

115a-115b. PRACTICE TEACHING. Teaching under supervision in the University High School and in the Minneapolis City Schools, in the regular secondary school subjects. The course calls for one period daily at the school where the work is assigned.

METHODS OF TEACHING

1. General Method. See above Course 11 (Technique of Teaching).

2. Teachers' Courses or Courses in Special Methods of Teaching High School Subjects.

A description of the methods courses offered in the Rural Training Department is given immediately after the following tabular statement.

A recent ruling of the State Department of Education requires courses in special methods of at least two different high-school subjects totaling at least three credits, for all applicants for the State Professional Teachers' Certificate. In some cases the amount of work necessary to meet this requirement will total six credits. In other cases a single teachers' course totaling only three credits is arranged in such a way as to cover two subjects, thereby satisfying this requirement; an example of this is the teachers' course in English and Rhetoric.

## METHODS COURSES

| No. | Credits | Title | | | Offered to | Prereq. courses |
|---|---|---|---|---|---|---|
| 31-32 | 3† | Animal Biology | | | Jr., sr. | 12 cr. in An. Bio. |
| | | 2, 3, 4 | T | | 213AB | Sigerfoos |
| 121 122 | 6 | Botany | | | Jr., sr., grad. | 12 cr. |
| | | 4 | MWF | | 200P | Clements |
| 20 | 2 | Chemistry | | | Sr. | 3-4 or 7-8 or 21-22 |
| | | Ar | Ar | | Ar | Ward |
| *80 | 3 | English (and rhetoric) | | | Jr., sr. | See statement |
| | | 3-4:30 | WF | | 113Ed | Inglis |
| 55 | 2 | Geography | | | Jr., sr., grad. | See statement |
| | | 8 | TThS | | 105P | Posey |
| 59-60 | 2 | German | | | Jr., sr. | 29-30 & 31-32 or 53-54 |
| | | 4 | F | | 209F | Schlenker |
| 56-57 | 3 | History & Political Science | | | Jr., sr. | See statement |
| | | 4 | MW | | 111Lib | Krey |
| 101 | 3 | Latin | | | Jr., sr. | 58 |
| | | 9 | TThS | | 109F | Pike |
| *1 | 1 | Library Methods | | | Jr., sr. | None |
| | | 11 | S | | 203Ed | Wilson |
| *4 | 1 | Cataloging | | | Jr., sr. | None |
| | | 11 | S | | 203Ed | Wilson |
| *11-12 | 3 | Manual Training | | | Sr. | 1-6 |
| | | 3 | MWF | | 114Ed | McGarvey |
| 54 | 2 | Mathematics | | | Jr., sr. | 11 |
| | | 3 | TTh | | 115Ed | Reeve |
| 110 | 2 | Norwegian | | | Sr., grad. | 3-4 |
| | | 4 & 5 | Th | | 206F | Bothne |
| 27-28 | 6 | Music | | | Jr., sr. | ..... |
| | | 4. 5 | WF | | 117Ed | Giddings |
| 15-16 | 6 | Physical Education | | | Jr., sr. | 1-2, 3-4, 21-22, 31-32 |
| | | Lect. 10 | ThS | | 201WGm | Kissock, Ladd, Tolg |
| | | Lab. 2 | MWF | | 3, 151, 153WGm | Kissock, Ladd, Tolg |
| 90 | 1 | Physics | | | Sr. | 2 & 4, 8 & 10, or 2 yrs. Physics |
| | | Ar | Ar | | Ar | Zeleny |
| 56-57 | 3 | Political Science & History | | | Jr., sr. | See statement |
| | | 4 | WF | | 111Lib | Schaper |
| *80 | 3 | Rhetoric (English) | | | Jr., sr. | See statement |
| | | 3-4:30 | WF | | 113Ed | Inglis |
| 161-162 | 2 | Romance Languages | | | Jr., sr., grad. | See statement |
| | | 2 | Th | | 201F | Olmsted, |
| 10 | 2 | Teachers' Course in Norwegian | | | Sr., grad. | 3-4 |
| | | 4 & 5 | Th | | 206F | Bothne |
| 116 | 2 | Swedish | | | Sr., grad. | 7-8 |
| | | Ar | Ar | | 206F | Stomberg |
| *152 | 1 | Elem. Methods in Reading | | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | Th | | 102Ed | Lommen |
| *153 | 1 | Elem. Methods in English | | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | Th | | 102Ed | Harlan |
| *154 | 1 | Elem. Methods in Indus. Arts. | | | Jr., sr., grad. | 1 or 101-102 |
| | | Ar | Ar | | Col. of Agr. | Lommen |
| *155 | 1 | Elem. Methods in History | | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | T | | 102Ed | Lommen |
| *156 | 1 | Elem. Methods in Geography. | | | Jr., sr., grad. | 1 or 101-102 |
| | | 5 | T | | 102Ed | Lommen |
| *157 | 1 | Elem. Methods in Arithmetic. | | | Jr., sr., grad. | 1 or 101-102 |
| | | Ar | Ar | | Ar | Harlan |

† Both semesters must be completed before credit is given for the first semester.
* Receives credit only in College of Education.

### HIGH SCHOOL TRAINING DEPARTMENT METHODS

152. ELEMENTARY METHODS IN READING. The place of reading in the rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural community. LOMMEN.

153. ELEMENTARY METHODS IN ENGLISH. The place of English in the rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural community. HARLAN.

154. ELEMENTARY METHODS IN INDUSTRIAL ARTS. The place of industrial arts in the rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural community. LOMMEN.

155. ELEMENTARY METHODS IN HISTORY. The place of history in the rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural community. LOMMEN.

156. ELEMENTARY METHODS IN GEOGRAPHY. The place of geography in the rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural communities. LOMMEN.

157. ELEMENTARY METHODS IN ARITHMETIC. The place of arithmetic in the rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural communities. HARLAN.

## AGRICULTURAL EDUCATION

Professors ASHLEY V. STORM, DEXTER D. MAYNE; Associate Professor WILBUR H. BENDER; Assistant Professor WILLIAM F. LUSK; Extension Specialists THEODORE A. ERICKSON, GEORGE F. HOWARD.

*General Statement.* For specialization in this department see special requirements in Course of Study.

### COURSES

| No. | Credits | Title | | Offered to | | Prereq. courses |
|---|---|---|---|---|---|---|
| 11a | 3 | Prin. of Industrial Education... | | All | | None |
| | | 9:50-10:35 | TThS | 317A | Lusk | |
| 11b | 3 | Prin. of Industrial Education... | | All | | None |
| | | 10:45-11:30 | TThS | 317A | Lusk | |
| 21 | 3 | Industrial Education ..... | | All | | None |
| | | 8:00-8:45 | TThS | 317A | Mayne | |
| 131a | 3 | Methods in Teaching High School Agriculture ..... | | Sr. | | 11 |
| | | 8:55-9:40 | TThS | 317A | Bender | |
| 141a | 3 | Teaching ..... | | Sr. | | 11 and 131 |
| | | 8:55-9:40 | MWF | 317A | Storm, Bender, Lusk | |
| 141b | 3 | Teaching ..... | | Sr. | | 11 and 131 |
| | | 9:50-10:35 | MWF | 317A | Storm, Bender, Lusk | |
| 151a | 3 | Organ. and Management..... | | Sr. | | None |
| | | 10:45-11:30 | MWF | 317A | Storm | |
| 151b | 3 | Organ. and Management..... | | Sr. | | None |
| | | 10:45-11:30 | MWF | 317A | Storm | |

### INTRODUCTORY COURSES

11a. PRINCIPLES OF INDUSTRIAL EDUCATION. A study of the fundamental principles upon which education is based. Throughout the course emphasis is placed on those phases which are most closely related to industrial education. LUSK.

11b. PRINCIPLES OF INDUSTRIAL EDUCATION. Same as Course 11a.

21. INDUSTRIAL EDUCATION. A short history of industrial education; the present status in Europe and United States; manual training and home arts in an educational system; the place of agriculture in the public schools; trade and vocational schools. MAYNE.

### ADVANCED COURSES

131a. METHODS IN TEACHING HIGH-SCHOOL AGRICULTURE. Fundamental elements of method in teaching as related to teaching agriculture in high school. Organizing subject matter of daily work; selection and manipulation of devices. Classroom and laboratory method. Specific plans for teaching secondary agriculture. BENDER.

141a. TEACHING. Observation of regular classes; interpretation of class practices; 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's teaching. STORM, BENDER, LUSK.

141b. TEACHING. Same as Course 141a.

151a. ORGANIZATION AND MANAGEMENT. Organization and management of work in secondary schools, particularly of Minnesota, with special reference to agricultural work, courses of study, programs, equipment, laboratory and class management, extension work, plots, and coördination of work. STORM.

151b. ORGANIZATION AND MANAGEMENT. Same as Course 151a.

## HOME ECONOMICS EDUCATION

Professor JOSEPHINE T. BERRY; Assistant Professors MABEL B. TRILLING, MARION WELLER; Instructor MILDRED WEIGLEY.

### COURSES

| No. | Credits | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| HE42 | 3 | Home Economics Education... | Jr. | He22, Psychol. 5b |
| | | 8:55-9:40 MWF | 213He | Berry |
| HE44 | 3 | Organ. & Methods of Teaching for Textiles and Clothing.... | Jr. | He13, Psychol. 5b |
| | | 8:55-9:40 MWF | 213He | Berry, Weller |
| HE45 | 1 | Home Economics Education.... | Sr. | He42 |
| | | 8:55-9:40 S | 213He | Berry |
| HE46 | 1 | Home Economics Education.... | Sr. | He45 |
| | | 8:55-9:40 S | 213He | Berry |

| | | | | | |
|---|---|---|---|---|---|
| HE47 | 3 | Observation and Teaching..... | | Sr. | He42 |
| | | 8:00-8:45 | TThS | 213He | Weigley |
| HE48 | 3 | Observation and Teaching..... | | Sr. | He42 |
| | | 8:00-8:45 | TThS | 309He | Trilling |

COURSES

H.E. 42. HOME ECONOMICS EDUCATION. Curricula, textbooks, equipment, methods of teaching, and class management, as applied to the teaching of Home Economics. BERRY.

H.E. 44. ORGANIZATION AND METHODS OF TEACHING FOR TEXTILES AND CLOTHING. A combination with Course H.E. 42, dealing with adaptations to the teaching of Textiles and Clothing. BERRY, WELLER.

H.E. 45. HOME ECONOMICS EDUCATION. A continuation of H.E. 42. BERRY.

H.E. 46. HOME ECONOMICS EDUCATION. A continuation of H.E. 45. BERRY.

H.E. 47. OBSERVATION AND TEACHING. Observation of teaching in regular classes; criticism and discussion of class practice, lesson plans, methods, results, and examinations; preparation of lesson plans, and directed teaching of foods and cookery and home management. WEIGLEY.

H.E. 48. OBSERVATION AND TEACHING. A course similar to Course H.E. 47 but dealing with the teaching of textiles and clothing. TRILLING.

## MANUAL TRAINING

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* the seventeen credits required in the prescribed course outlined below, or their equivalent.

*For a Major,* manual training cannot be offered as a major.

*For a Teacher's Certificate,* completion of the following prescribed course or its equivalent and the Educational work outlined under course of study for University Teachers' Certificate.

COURSES

| No. | Credits | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1 | 1½ | Mechanical Drawing ..... | | Jr. | None |
| | | 4-6 | TTh | 114Ed | McGarvey |
| 2 | 1½ | Mechanical Drawing ..... | | Jr. | 1 |
| | | 4-6 | TTh | 114Ed | McGarvey |
| 3 | 2 | Descriptive Geometry ..... | | Jr. | None |
| | | 10-11 | MTThS | 101MechE | Kirchner |
| | | 1-2 | M | | |
| | | Lect. 9 | Th | | |
| | | or Lect. 9 | W | | |
| | | 10-12 | TWThS | 101MechE | Kirchner |
| | | Lect. 9 | Th | | |
| | | 8-10 | MWF | 101MechE | Kirchner |
| | | 3-5 | F | | |
| | | Lect. 9 | F | | |
| | | 8-10 | WF | 101MechE | Kirchner |
| | | 1-3 | WF | | |
| | | Lect. 9 | T | 101MechE | Kirchner |

| | | | | | |
|---|---|---|---|---|---|
| 5 | 2 | Wood Work ..... | | Jr. | None |
| | | 4-6 | MWF | 114Ed | McGarvey |
| 6 | 2 | Wood Work ..... | | Jr. | 5 |
| | | 4-6 | MWF | 114Ed | McGarvey |
| 7 | 2 | Wood Turning & Pattern Making | | Sr. | 1-5 |
| | | 8-11 | ThS | 102MechE | Richards |
| | | 9-12 | MF | 102MechE | Richards |
| 8 | 2 | Foundry Work ..... | | Sr. | 1-5, 7 |
| | | 8-11 | ThS | 104MechE | ..... |
| | | 9-12 | MF | 104MechE | ..... |
| 9 | 2 | Forge ..... | | Sr. | 1-5 |
| | | 8-11 | ThS | 102MechE | Quigley |
| | | 9-12 | MF | 102MechE | Quigley |
| 10 | 2 | Machine Shop ..... | | Sr. | 1-5 |
| | | 8-11 | ThS | 104MechE | Shipley |
| | | 9-12 | MF | 104MechE | Shipley |
| 11-12 | 3 | Teaching and Supervision of Manual Training ..... | | Sr. | 1-6 |
| | | 3 | MWF | 114Ed | McGarvey |

NOTES: 1. In all Manual Training courses each credit hour calls for at least three hours of shop work.

2. In courses 1-3 students provide their own instruments and materials. A laboratory fee of three dollars per course will be charged for courses 5-10, inclusive.

1. MECHANICAL DRAWING. A course to develop the principles of freehand drawing and simple perspective. The use of drawing instruments, lettering, the making of working drawings, tracing, and blue printing. MCGARVEY.

2. MECHANICAL DRAWING. Orthographic and isometric projection, lettering, drawing from machine models, cabinet drawing, topographic drawing, shop details, and elements of architectural drawing. MCGARVEY.

3. DESCRIPTIVE GEOMETRY. Note. Course offered in the Engineering College, No. 9. KIRCHNER.

5. WOOD WORK. Work adapted to upper grammar grades and first year high school, with the emphasis placed upon the preparation of models suitable for these grades. Student demonstrations of simple projects. Shop fee $3.00. MCGARVEY.

6. WOOD WORK. Selection, installation, and care of wood-working machines, application of design to wood-working problems, the group plan of working on projects, use of model structures, application of Manual Training to some simple structure. Work suitable to the different types of high schools. Shop fee $3.00. MCGARVEY.

7. WOOD TURNING AND PATTERN MAKING. RICHARDS.

8. FOUNDRY WORK. .....

9. FORGE. QUIGLEY.

10. MACHINE SHOP. SHIPLEY.

11-12. THE TEACHING AND SUPERVISION OF MANUAL TRAINING—TEACHERS' COURSE. A study of the history and aims of Industrial Education and the methods of presenting Manual Training and Drawing to grade and high school pupils. The outlining of courses and the selecting of equipment adaptable to different types of school systems. MCGARVEY.

## TEACHERS OF PHYSICAL EDUCATION

Seniors desiring special teachers' certificates in physical education will be expected to complete the courses listed below.

| No. | Title | Credits |
|---|---|---|
| 13 | Personal Hygiene | 3 |
| 5-6 | Advanced Physical Training | 3 |
| | Theory of Physical Education | 6 |
| | Practice Teaching | 6 |
| 3a | Social Education | 3 |
| 11a | Technique of Teaching | 3 |
| 1 or 101-102 | History of Education | 3 |
| 141 | School Sanitation and Public Health | 3 |

## TEACHER-LIBRARIAN TRAINING

Lecturer MARTHA WILSON.

The satisfactory completion of the following courses will render a student eligible for a high-school teacher-librarian certificate, provided he has complied with the other regulations leading to a certificate and degree in the College of Education. (See statement, page 22.)

COURSES

| No. | Credit | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1 | 1 | Elementary Library Methods | Jr., sr. | None |
| | | 11 S | 203Ed | Wilson |
| 2 | 1 | Library Organization (Not offered in 1916-17) | Jr., sr. | 1 |
| 4 | 1 | Cataloging | Jr., sr. | 1 |
| | | 11 S | 203Ed | Wilson |

1. ELEMENTARY LIBRARY METHODS FOR TEACHERS. Introductory course—problems of the high-school library, arrangement, selection of books, catalogs, book lists, methods of ordering books, and library cards; training teachers to teach students the use of the high-school library. WILSON.

2. LIBRARY ORGANIZATION. Library organization, including classification, arrangement, and school library administration. (Not offered in 1916-17). WILSON.

4. CATALOGING. Definite training in elementary cataloging, the making of a dictionary catalog, and the use and adaptation of Library of Congress and other printed catalog cards. WILSON.

## HIGH-SCHOOL RURAL TRAINING

Director LOTUS D. COFFMAN; Lecturers MABEL CARNEY, CHARLES L. HARLAN, GEORGIANA LOMMEN.

### REQUIREMENTS OF THE DEPARTMENT

1. *For Admission.* (1) Two years of rural teaching experience; (2) Advanced diploma from a State Normal School. For exceptions, see statement, page 23.

2. *For Recommendation for State Endorsement.* For explanation, see page 23 of this bulletin.

Students who complete the following course will be eligible for recommendation for the endorsement of the State Department of Education as teachers of high-school rural training departments.

In the following course, Education is selected as a major. The two minors recommended are English and Economics. The Education courses, in *italics* are all required, but previous training, experience, and needs of the student may modify his choice of minors and of other electives. Normal school graduates are credited with the History of Education and Introductory Psychology, consequently these courses are not included in the following outline. (See also page 23.)

### PRESCRIBED COURSE FOR HIGH SCHOOL RURAL TRAINING TEACHERS

#### JUNIOR YEAR

| *First Semester* | Credit | *Second Semester* | Credit |
|---|---|---|---|
| Education: | | Education: | |
| 107. *Problems of the Training Department* (monthly lectures and conferences) Miss Carney | None | 108. *Continuation of 107* | None |
| | | 152. *Elem. Meth. in Read.* | 1 |
| | | 154. *Elem. Meth. in Ind. Arts* | 1 |
| | | 156. *Elem. Meth. in Geog.* | 1 |
| 3a. *Social Aspects of Educ.* | 3 | | |
| Philosophy: | | | |
| 17. Methods of Study | 3 | | |
| Economics: | | | |
| 3b. General Economics | 3 | | |
| English: | | English: | |
| 1. General Survey | 3 | 2. General Survey | 3 |
| | | Home Economics*† | 3 |

#### SENIOR YEAR

| *First Semester* | Credit | *Second Semester* | Credit |
|---|---|---|---|
| Education: | | Education: | |
| 107. *Problems of the Training Department* (monthly lectures and conferences) Miss Carney | None | 108. *Continuation of 107* | None |
| | | 142. Industrial Education | 3 |
| | | 115. Practice Teaching | 3 |

* Courses to be selected according to individual interests after conferences with head of department.

† A course in Home Economics especially designed for teachers of high school training departments will be arranged in case the number of registrations and the community of needs of students warrants this.

| | |
|---|---|
| 11a. Technique of Teaching..... | 3 |
| 123. School Supervision ..... | 3 |
| 153. *Elem. Meth. in English*.... | 1 |
| 155. *Elem. Meth. in History*..... | 1 |
| 157. *Elem. Meth. in Arith.* ..... | 1 |
| Sociology: | |
| 119. The Family ..... | 3 |
| English: | |
| 63. 19th Century Literature..... | 3 |
| Agriculture* ..... | 3 |
| Philosophy: | |
| 18. Child Development ..... | 3 |
| Sociology: | |
| 120. Social Progress ..... | 3 |
| 6. Social Reform Movements.... | 3 |
| English: | |
| 122. American Literature ..... | 3 |

Descriptions of all courses above not definitely referred to in footnotes will be found in the proper Departmental Statement.

## ANATOMY

Professors CLARENCE M. JACKSON, JOHN B. JOHNSTON, THOMAS G. LEE, RICHARD E. SCAMMON; Associate Professor CHARLES A. ERDMANN; Instructor JAY A. MYERS.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

Prerequisites in Animal Biology may be counted as a part of the work for a minor or major.

### COURSES

| No. | Credits | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 3-4 | 10 | Gross Human Anatomy ..... | | Soph., jr., sr. | An. Biol. 1-2 |
| | | Lab. 8, 9, 10, 11 | TThS | 304-308IA | Jackson, et al. |
| | | Lect. 1 | MW | 304IA | Jackson |
| 101 | 5 | Human Histology ..... | | Jr., sr. | An. Biol. 7 |
| | | Lab. 8, 9, 10 | MWF | 105-108IA | Scammon, et al. |
| | | Lect. 11 | MF | 102IA | Scammon |
| 102 | 3 | Human Embryology ..... | | Jr., sr., grad. | An. Biol. 7 |
| | | Lect. 11 | MW | 102IA | Scammon |
| | | Quiz. 3 | Th | 106-108IA | Lee, et al. |
| | | Lab. 3, 4, 5 | M or W or F | 106-108IA | Lee, et al. |
| 103 | 3 | Human Neurology ..... | | Sr., grad. | Anat. 101 & 102 or An. Biol. 7-8 or 19-20 |
| | | Lab. 8, 9, 10 | ThS | 214-215IA | Johnston, et al. |
| 114 | 3 | Topographic Anatomy ..... | | Sr., grad. | 3-4 |
| | | Lab. 1, 2, 3 | TTh | 313IA | Jackson |
| 115 | 3 | Fetal Anatomy ..... | | Sr., grad. | 3-4 and 102 or An. Biol. 137 |
| | | Lab. Ar. | TTh | 214IA | Scammon |

General Zoology (Animal Biology 1) is an additional prerequisite for all courses in Human Anatomy.

NOTE: Since the number of students in anatomy courses Nos. 3-4, 101 and 102, is limited, students will not be permitted to register for these courses without written permission by the head of the department.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, page 88.

## ANIMAL BIOLOGY

Professors HENRY FRANCIS NACHTRIEB, JOHN B. JOHNSTON, THOMAS S. ROBERTS, CHARLES P. SIGERFOOS; Associate Professor HAL DOWNEY; Assistant Professors ELMER J. LUND, OSCAR W. OESTLUND; Instructors GEORGE DELVIN ALLEN, CHARLES E. JOHNSON; Assistants ADOLPH RINGOEN, HELEN SANBORN; Teaching Fellows ROYAL N. CHAPMAN, HERBERT E. METCALF.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* freshman year, Course 1-2; sophomore year, the student may elect from Courses 7-8, 15-16, 19-20, 23-24; during the junior year the student must elect from Courses 31 to 144, and must include some line of work begun in the sophomore year which he expects to pursue during the senior year under 161-162.

*For a Teacher's Certificate* an average of one and one-half honor points and six other credits in Animal Biology and six credits in Botany.

### JOURNAL CLUB

The professors, instructors, and advanced students of the department meet once a week to review and discuss current zoological literature and to listen to reports from those carrying on investigations.

### COURSES

| No. | Credits | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2 | 6 | General Zoology ..... | All | None |
| | 1 | Lab. 8, 9 WF | 101AB | |
| | | Lect. 10 WF | 312AB | |
| | 2 | Lab. 10, 11 WF | 101AB | |
| | | Lect. 9 WF | 312AB | |
| | 3 | Lab. 1, 2 M | 101AB | |
| | | Lab. 2, 3 W | 101AB | |
| | | Lect. 1 WF | 312AB | |
| | 4 | Lab. 8, 9 ThS | 101AB | |
| | | Lect. 10 ThS | 312AB | |
| | 5 | Lab. 10, 11 ThS | 101AB | |
| | | Lect. 9 ThS | 312AB | |
| | | Extra Laboratory Classes | | |
| | 6 | Lab. 8, 9 MT | 101AB | |
| | 7 | Lab. 10, 11 MT | 101AB | |
| 7-8 | 6* | Histology-Embryology ..... | Soph., jr., sr. | 1-2 |
| | | 10, 11 MWF | 201, 211AB | Downey |
| 12 | 3 | Histological Technique .... | Soph., jr., sr. | 1-2 and 7-8 |
| | | See Anatomy Schedule. | | |
| 15-16 | 6* | General Physiology ..... | Jr., sr. | 12 cr. in An. Biol. or Zool. 1-2 & Chem. 13-14 or 35-36 |
| | | 2, 3 MWF | 20AB | Lund |
| 19-20 | 6* | Comp. Gross Anat. of Vert. | Soph., jr., sr. | 1-2 |
| | | 2, 3 MWF | 105, 109, 211AB | Johnson |

| | | | | | |
|---|---|---|---|---|---|
| 23-24 | 6* | Entomology ..... | | Soph., jr., sr. | 1-2 |
| | | 10, 11 | MWF | 208, 210AB | Oestlund |
| | | 8, 9 | TThS | 208, 210AB | Oestlund |
| 28 | 3 | Ornithology ..... | | Soph., jr., sr. | 1-2 |
| | | 2, 3, 4 | TTh | 211, 314AB | Roberts |
| 30 | 3 | Neurology ..... | | Soph., jr., sr. | 1-2 |
| | | Ar | Ar | 215IA | Johnston |
| 31-32 | 3* | Nature Study ..... | | Jr., sr. | 12 cr. in An. Biol. |
| | | 2, 3, 4 | T | 213AB | Sigerfoos |
| 51 | 3† | Protozoology ..... | | Jr., sr. | 9 cr. inc. 1-2 |
| | | 8, 9 | TThS | 213AB | Sigerfoos |
| 56 | 3† | Morphology of Invertebrates | | Jr., sr. | 9 cr. inc. 1-2 |
| | | 8, 9 | TThS | 213AB | Sigerfoos |
| 101-102 | 6 | Advanced Entomology .... | | Jr., sr., grad. | 1-2, 23-24 |
| | | 2, 3 | MWF | 208, 210AB | Oestlund, Chapman |
| 107-108 | 6 | Gen. Ecology of Insects... | | Jr., sr., grad. | 1-2, 23-24 |
| | | 2, 3, 4 | TTh | 208, 210AB | Oestlund, Chapman |
| 115-116 | 6 | Mammalogy ..... | | Jr., sr., grad. | 1-2, 7-8, or 19-20 |
| | | 4, 5 | MWF | 107, 109, 211AB | Johnson |
| 119-120 | 6 | Vertebrate Histology ..... | | Sr., grad. | 1-2, 7-8, 12 |
| | | 3, 4 | TThS | 201, 211AB | Downey |
| 123-124 | 6† | Blood of Vertebrates..... | | Sr., grad. | 1-2, 7-8, 12, 137-138, reading knowledge of French and German |
| | | 3, 4 | TThS | 201, 211AB | Downey |
| 131-132 | 6† | Embryology ..... | | Jr., sr., grad. | 1-2, 7-8 |
| | | 10, 11 | MWF | 211, 202AB | Nachtrieb |
| 143-144 | 6 | Genetics and Eugenics..... | | Sr., grad. | 1-2, 7-8, or 131-132, 15-16 |
| | | 2, 3, 4 | TTh | 220, 211AB | Nachtrieb |
| 161-162 | 6 or 12 | Problems ..... | | Sr., grad. | 1-2 and other courses prescribed by dept. |

Hours, days, and rooms arranged.

So far as possible students should register for both lecture and laboratory work in the same section.

† Both semesters must be completed before credit is given for the first semester. Courses 51 and 56 may be combined for a year-course.

31-32. NATURE STUDY. Discussions, reference, field and laboratory work, through the year, once a week and, in addition, field trips Saturday afternoons during the autumn and spring months. Especially for the fitting of teachers in secondary schools. SIGERFOOS.

## ASTRONOMY

Professor FRANCIS P. LEAVENWORTH; Assistant Astronomer WILLIAM O. BEAL.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* Courses 51-52 and 101-102 (the latter taken as a three-hour course), or Courses 13-14 and 101-102 (the latter taken as a three-hour course).

*For a Major,* Courses 21, 51-52, and 101-102 (the latter taken as a six-hour course), and Mathematics 4.

*For B.A. with Honors,* the general requirements (page 15), Courses 51-52, 101-102 (as a six-hour course), and six credits in Physics.

*Starred Courses.* The College of Education has as yet adopted no system of starred courses. Nevertheless, candidates for the degree of Bachelor of Arts with Distinction will in some cases be obliged, in order to meet the departmental requirements, to be guided by this system and should therefore consult the departmental statements in the Science, Literature, and the Arts bulletin.

### ASTRONOMICAL OBSERVATORY

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.

COURSES

| No. | Credits | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 9-10 | 3 | Descriptive Astronomy ... | Soph., jr., sr. | None |
| | 7:30 p.m. | T | 124F | Beal |
| 11a | 3 | Descriptive Astronomy ... | Soph., jr., sr. | None |
| | | 9 MWF | 124F | Leavenworth |
| | | 11 TThS | 124F | Beal |
| 11b | 3 | Descriptive Astronomy ... | Soph., jr., sr. | None |
| | | 11 MWF | 124F | Leavenworth |
| | | 11 TThS | 124F | Beal |
| 13-14 | 6 | Descr. Astr. & Obs. Prac.. | Soph., jr., sr. | None |
| | | 9 TThS | 124F | Beal |
| *51-52 | 6 | General Astronomy ..... | Jr., sr. | 1 yr. mathematics |
| | | 2 MWF | 124F | Leavenworth |
| 62a | 3 | Elem. of Pract. Astr. .... | Soph., jr., sr. | 1 yr. mathematics |
| | | Ar Ar | 124F | Beal |
| 62b | 3 | Elem. of Pract. Astr. .... | Soph., jr., sr. | 1 yr. mathematics |
| | | Ar Ar | 124F | Beal |
| *101-102 | 6 or 12 | Practical Astronomy ..... | Jr., sr., grad. | Math. 7 and 11 |
| | | 10 TThS or MTWThFS | 124F | Leavenworth |
| *140 | 2 | Method of Least Squares. | Sr., grad. | Math. 51 |
| | | Ar Ar | O | Leavenworth |

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 39-40.

## BACTERIOLOGY

Associate Professor WINFORD P. LARSON; Instructors ARTHUR T. HENRICI, ANNE BENTON.

COURSES

| No. | Credits | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 58a | 4 | General Bacteriology ..... | Soph., jr., sr. | Gen. Chem. & either Zool. 1-2 or Bot. 1 |
| | | 2, 3 MWF | Lab. PH&P | Larson |

| | | | | | | |
|---|---|---|---|---|---|---|
| 58b | 4 | General Bacteriology ..... | | | Soph., jr., sr. | Gen. Chem. & either Zool. 1-2 or Bot. 1 |
| | | Ar | Ar | | PH&P | Larson |
| 59 | 3 | Special Bacteriology ..... | | | Jr., sr., grad | Bact. 58 |
| | | Ar | Ar | | PH&P | Larson |
| 104 | 3 | Special Bacteriological Technique. | | | Jr., sr., grad. | Bact. 58 |
| | | 2, 3 | MWF | | Lab.PH&P | Larson, et al. |

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 40-41.

## BOTANY

Professors FREDERIC E. CLEMENTS, CARL OTTO ROSENDAHL, JOSEPHINE E. TILDEN; Assistant Professors HERBERT F. BERGMAN, *FREDERIC K. BUTTERS, NED L. HUFF; Instructor WILLIAM S. COOPER; Assistants DONALD FOLSOM, FRANCES L. LONG, HARVEY STALLARD, VINNIE A. PEASE; Teaching Fellow ARTHUR M. JOHNSON.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, of which not more than six credits may be in introductory courses.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 15); thirty-six credits in Botany, of which twenty-four shall be selected from advanced Courses 105-106 to 119-120 inclusive. Those electing the Honors Course are urged to secure twelve credits during the sophomore year.

*For a Teacher's Certificate,* an average of at least one honor point for each credit hour in one introductory and one intermediate course, and in Course 121-122. One year of Zoology is also advised.

Students entering the department without preparation must take Course 1, followed by 2, 3b or 4. Students coming from an approved high school course will take Course 1a, 2 or 3a according to preparation. Those who expect to pursue botany for a single year only will take Course 3b or 4 during the second semester, while those who plan to take a major in botany are advised to take Course 2.

### COURSES

*Introductory Courses*

| No. | Credits | Title | | | Offered to | Prereq. courses |
|---|---|---|---|---|---|---|
| 1a | 3 | Gen. Botany, Lab. & Class.. | | | All | None |
| | | 8, 9 | MWF | | 207P | |
| | | 10, 11 | MWF | | 207P | |
| | | 1, 2 | MWF | | 207P | |
| | | 2, 3, 4 | MF | | 212P | |
| | | 3, 4 | MWF | | 207P | |
| | | 8, 9 | TThS | | 207P | |
| | | 10, 11 | TThS | | 207P | |
| | | 1, 2, 3 | TTh | | 207P | |
| | | 2, 3, 4 | TTh | | 212P | |

* On leave for the year 1916-17.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1b | 3 | Gen. Botany, Lab. & Class.. | | | All | None |
| | | 8, 9 | MWF | 207P | | |
| | | 2, 3, 4 | MF | 207P | | |
| 2a | 3 | Structural Botany ..... | | | All | 1, 3a or approved High School Botany |
| | | 1, 2 | MWF | 214P | | |
| 2b | 3 | Structural Botany ..... | | | All | 1, 3a or approved High School Botany |
| | | 10, 11 | MWF | 207P | | |
| | | 2, 3, 4 | MF | 214P | | |
| | | 2, 3, 4 | TTh | 207P | | |
| 3a | 3 | Evolution of Plants ..... | | | All | 1 or approved High School Botany |
| | | 10, 11 | MWF | 212P | | |
| 3b | 3 | Evolution of Plants ..... | | | All | 1 or approved High School Botany |
| | | 10, 11 | MWF | 212P | | |
| | | 1, 2 | MWF | 212P | | |
| | | 2, 3, 4 | TTh | 212P | | |
| 4 | 3 | Field and Garden Botany... | | | All | 1, 2 or 3a |
| | | 8, 9 | MWF | 1G | | |
| | | 10, 11 | MWF | 1G | | |
| | | 1, 2 | MWF | 1G | | |
| | | 3, 4 | MWF | 1G | | |
| | | 2, 3, 4 | MF | 2G | | |
| | | 8, 9 | TThS | 1G | | |
| | | 10, 11 | TThS | 1G | | |
| | | 2, 3, 4 | TTh | 1G | | |

*Intermediate Courses*

| | | | | | | |
|---|---|---|---|---|---|---|
| 5-6 | 6 | Plant Morphology ..... | | | Soph., jr., sr. | 6 cr.; see statement |
| | | 10, 11 | MWF | 206P | Huff | |
| 7-8 | 6 | Taxonomy ..... | | | Soph., jr., sr. | 6 cr.; see statement |
| | | 10, 11 | MWF | 20P | Rosendahl | |
| | | 2, 3, 4 | TTh | 20P | Rosendahl | |
| 9-10 | 6 | Physiology and Ecology ..... | | | Soph., jr., sr. | 6 credits |
| | | Class 3 | MF | 210P | Clements | |
| | | Lab. 1, 2 | MF | 3G | Cooper | |
| | | Class 3 | TTh | 210P | Clements | |
| | | Lab. 1, 2 | TTh | 3G | Cooper | |
| 11-12 | 6 | Industrial Botany ..... | | | Soph., jr., sr. | 6 cr.; inc. 2 or 3 |
| | | 10, 11 | TThS | 212P | Tilden | |
| 13-14 | 6 | Mycology ..... | | | Soph., jr., sr. | 6 credits |
| | | Not offered in 1916-17. | | | | |

*Advanced Courses*

| | | | | | | |
|---|---|---|---|---|---|---|
| *103 | 3 | Foodstuffs and Textiles ..... | | | Jr., sr., grad. | 9 credits |
| | | Not offered in 1916-17. | | | | |
| *105-106 | 6 | Algae ..... | | | Jr., sr., grad. | 9 credits |
| | | 1, 2, 3 | TTh | 212P | Tilden | |
| *107-108 | 6 | Mosses and Ferns ..... | | | Jr., sr., grad. | 9 cr.; inc. 2 or 3, or 5-6 |
| | | Not offered in 1916-17. | | | | |
| *110 | 6 | Gymnosperms ..... | | | Jr., sr., grad. | 7-8 or 107-108 |
| | | Not offered in 1916-17. | | | | |
| *111-112 | 6 | Advanced Taxonomy ..... | | | Jr., sr., grad. | 7-8 |
| | | Not offered in 1916-17. | | | | |
| *113-114 | 6 | Advanced Ecology ..... | | | Jr., sr., grad. | 9-10 |
| | | Ar | Ar | 200P | Clements and Cooper | |

| | | | | | |
|---|---|---|---|---|---|
| *115-116 | 6 | Advanced Plant Physiology.. | Jr., sr., grad. | 9-10 | |
| | | Ar Ar | 200P | Clements and Bergman | |
| *117-118 | 6 | Cytology ..... | Jr., sr., grad. | 18 credits | |
| | | Ar Ar | 8P | Rosendahl | |
| *119-120 | 6 | Advanced Industrial Botany. | Jr., sr., grad. | 11-12 | |
| | | Not offered in 1916-17. | | | |
| *121-122 | 6 | Plant Studies and Methods.. | Jr., sr., grad. | 12 credits | |
| | | 4 MWF | 200P | Clements | |

*121-122. PLANT STUDIES AND METHODS. The subjects of nature-study and high-school botany presented as they are to be taught; the material considered in detail in proper sequence, and training in method afforded by practice in the University and Minneapolis High Schools. CLEMENTS.

**All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 41-45.**

## CHEMISTRY

### THE SCHOOL OF CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Associate Professor EVERHART P. HARDING; Assistant Professors IRA H. DERBY, WILLIAM H. HUNTER, EDWARD E. NICHOLSON; Instructors ROSS A. BAKER, FRANK W. BLISS, LILLIAN COHEN, J. GERHARD DIETRICHSON, WOLF KRITCHEVSKY, FRANK H. MACDOUGALL, WOLDEMAR STERNBERG, EARLE K. STRACHAN, H. LEE WARD; Assistants ARTHUR R. CADE, O. D. CUNNINGHAM, ELMER T. FEGAN, FLOYD E. JOYCE, WALTER M. LAUER, ALLEN F. NEWMAN, S. JOSEPH REICHERT.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

In Chemistry the purpose of the honors course is served by the Five-Year Course in Arts and Chemistry.

*For a Teacher's Certificate,* an average of at least one and one-half honor points for each credit hour in Courses 1-2 or 3-4 and 7-8 or 11-12; and 20.

### COURSES

*Division of General and Inorganic Chemistry*

| No. | Credits | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2 | 6† | General Chemistry ..... | Those entering without chemistry | None |
| | | 8, 9 TThS | 110 | |
| | | 10, 11 MWF | 110 | |
| 21-22 | 10† | Inorganic & Qualita. Chem.. | Those entering without chemistry | None |
| | | Lect. 1 M | 100 | |
| | | Lab. 8, 9 TTh | 110 | |
| | | Rec. 10 TThS | 111 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3-4 | 6† | Adv. Gen. Chem. & Qu. An. | | Fr., soph., jr. | | Entrance cr. in chem. |
| | | Lect. 1 | M | 100 | | |
| | | Lab. 2, 3 | MW | 110 | | |
| | | Rec. 2 or 3 | F | 111 | | |
| | | Lab. 10, 11 | TTh | 110 | | |
| | | Rec. 10 or 11 | S | 115 | | |
| 7-8 | 6† | Qualitative Analysis ..... | | Soph. | | 1-2 |
| | | 8, 9 | MWF | 210 | Nicholson | |
| | | 10, 11 | MWF | 210 | Bliss | |
| 10 | 1 | Glass Blowing ..... | | Jr., sr. | | None |
| | | Ar | Ar | 49 | Baker | |
| 17 | 2 | Inorganic Colloquium ..... | | Sr. | | 11-12 |
| | | 11 | MW | 111 | Baker | |
| 20 | 2 | Teachers' Course ..... | | Sr. | | 3-4 or 7-8 or 21-22 |
| | | Ar | Ar | Ar | Ward | |
| *167-168 | 4† | Adv. Inorganic Chemistry.. | | Jr., sr. | | 2 yrs. college chem. |
| | | Ar | Ar | Ar | Baker | |
| *169-170 | 4† | Chem. of the Rare Elements. | | Jr., sr. | | 11-12 |
| | | Ar | Ar | Ar | Nicholson | |

*Division of Analytical Chemistry*

| | | | | | | |
|---|---|---|---|---|---|---|
| *11-12 | 8† | Quantitative Analysis ..... | | Jr., sr. | | 3-4 or 7-8, or 21-22 & 1 year math. or physics 1‡ |
| | | 1-5 | F | 310 | Sidener | |
| | | 2-5 | MW | 310 | Sidener | |
| *107-108 | 6† | Adv. Quantitative Analysis. | | Jr., sr. | | 11-12 |
| | | Ar | Ar | 317 | Sidener | |

*Division of Organic Chemistry*

| | | | | | | |
|---|---|---|---|---|---|---|
| 13-14 | 6† | Medical Organic Chemistry. | | Soph. | | 3-4 or 7-8 or 21-22 |
| | | Lect. 1 | WF | 325 | Hunter | |
| | | Lab. 2-5 | T | 10 | Hunter | |
| | | Lab. 3 hrs. | Ar | 10 | Hunter | |
| 18 | 2 | Organic Colloquium ..... | | Sr. | | 35-36 |
| | | Ar | Ar | Ar | Frankforter | |
| *35-36 | 8† | Organic Chemistry ..... | | Jr., sr. | | 3-4 or 7-8 or 21-22 & 1 yr. Biol. Science |
| | | Lect. 11 | TTh | 100 | Frankforter | |
| | | Lab. 2-5 | MW | 10 | Kritchevsky | |
| | | Rec. 1 | W | 315 | Kritchevsky | |
| *115 | 2 | Adv. Organic Chemistry ... | | Sr. | | 35-36 |
| | | Ar | Ar | Ar | Hunter | |
| *116 | 2 | Theoretical Organic Chem.. | | Sr. | | 35-36 |
| | | Ar | Ar | Ar | Hunter | |

*Division of Physical Chemistry*

| | | | | | | |
|---|---|---|---|---|---|---|
| *121-122 | 4† | Physical Chemistry ..... | | Jr., sr. | | 35-36, Physics 2 & 4 |
| | | 11 | WF | 115 | Derby | |
| *123-124 | 2† | Physico-chemical Lab. ..... | | Jr., sr. | | Must be taken in conjunctn. with 121-122 |
| | | 2-5 | F | 117 | Derby | |
| *125-126 | 6† | Adv. Physical Chemistry... | | Sr. | | 121-122 |
| | | Ar | Ar | Ar | Derby | |
| *128 | 2 | Radiochemistry ..... | | Jr., sr. | | 3-4 or 7-8 or 21-22 & Physics 2 and 4 |
| | | Ar | Ar | Ar | Derby | |

*Division of Technological Chemistry*

| | | | | | |
|---|---|---|---|---|---|
| 27-28 | 4† | Chem. in Every Day Life... | | Jr., sr. | 3-4 or 7-8 or 21-22 |
| | | 2-5:30 | TTh | Ar | Frankforter and Harding |

*Division of Industrial Chemistry*

| | | | | | |
|---|---|---|---|---|---|
| 15 | 2 | Photochemistry ..... | | Jr., sr. | 3-4 or 7-8 or 21-22 |
| | | Lect. 8 | M | 27 | Strachan |
| | | Lab. 2-5 | Th | 27 | Strachan |
| 16 | 2 | Color Photography ..... | | Jr., sr. | 15 |
| | | Lect. 8 | M | 27 | Strachan |
| | | Lab. 2-5 | Th | 27 | Strachan |

† Both semesters must be completed before credit is given for the first semester.
‡ This physics may be taken at the same time.

20. TEACHERS' COURSE. For those who expect to teach Chemistry. WARD.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 45-49.

## COMPARATIVE PHILOLOGY

Professor FREDERICK KLAEBER.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* Courses 101, 102, 106, 109, 110, 141.

*For a Major,* Courses 101, 102, 106, 109, 110, 141, with German 3-4 (or 5-6) and 7-8 and English 1-2 as prerequisites.

*For B.A. with Honors.* The required credits in the major may be elected from the undergraduate courses of the department and English 8, 101, 103, and German 107-108.

This department, besides offering courses in the general principles of linguistic science, affords an opportunity for elementary studies in Comparative Indo-European Philology, and more particularly the investigation of Old Germanic dialects. Related courses in English Philology will be found under English Language and Literature.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| *101 | 2 | Science of Language..... | | Jr., sr., grad. | See statement |
| | | 2 | WF | 205F | Klaeber |
| *102 | 2 | Science of Language (Adv.) | | Jr., sr., grad. | Same as for 101 |
| | | See statement | | | |
| *104 | 2 | Germanic Philology ..... | | Jr., sr., grad. | Same as for 101 |
| *105 | 1 | Universal Language ..... | | Jr., sr., grad. | Same as for 101 |
| | | 10 | S | 302F | Klaeber |
| *106 | 2 | Life of Words ..... | | Jr., sr., grad. | Same as for 101 |
| | | 2 | WF | 205F | Klaeber |
| *109-110 | 4† | Hist. of German Language.. | | Sr., grad. | German 53, 54 |
| | | See statement | | | |
| *141-142 | 4 | Hist. Gram. of Eng. Language | | Jr., sr., grad. | English 1-2, 3 |
| | | 2 | TTh | 205F | Klaeber |

† Both semesters must be completed before credit is given for either semester.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 49-50.

## DRAWING AND DESCRIPTIVE GEOMETRY

Professor WILLIAM H. KIRCHNER; Instructor ROBERT W. FRENCH.

### COURSES

| No. | Credit | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 21-22 | 4 | Technical Drawing ..... | All | None |
| | | 8, 9 MWF | 13MechE | Kirchner, French, et al. |

21-22. TECHNICAL DRAWING. Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings, and translations. KIRCHNER, FRENCH.

## ECONOMICS

Professors JOHN H. GRAY, E. DANA DURAND; Assistant Professors ROY G. BLAKEY, J. FRANKLIN EBERSOLE, THOMAS WARNER MITCHELL; Instructors LLOYD M. CROSGRAVE, WILLIAM W. CUMBERLAND, HARRY D. HARPER, ALBERT C. JAMES, ROBERT J. MCFALL; In the General Extension Division, Associate Professor CLARE L. ROTZEL; Assistant Professor CHARLES H. PRESTON; Instructor RAYMOND V. PHELAN.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits, including Course 4.

*For B.A. with Honors,* thirty credits in the major line of work with the usual supporting credits, and not less than sixty credits altogether in Group B.

*For a Teacher's Certificate in Business Subjects,* a major in Economics, including Accounting and Economic Geography.

*Vocational Course in Business Education.* The requirements for this course leading to the B.A. degree may be found on page 27 of the Science, Literature, and the Arts bulletin.

The departments of Economics, Political Science, History, and Sociology and Anthropology constitute a social science group. The subjects are intimately inter-related, and they are all of special importance to students who intend to engage in law, business, public service at home or abroad, journalism, the work of charities and corrections, or to give instructions in one of the social sciences. Students who are interested in the work of any one of the departments of the social science group ought to be familiar with at least the elements of the subjects offered in the other departments. A student who takes his major in any one of them ought to have more than the elements of the others.

For admission to candidacy for the Master's Degree, students must have twelve credits in Economics including the equivalent of Courses 3-4, (General Economics). They must also satisfy the Department that they have had an adequate training in the other social sciences for the particular work they wish to do.

## SUGGESTIONS AS TO COURSES IN THE DEPARTMENT

In order to aid students who have some idea as to their intended profession or calling to make a wise choice of courses, the accompanying tabular statement has been prepared.

These recommendations are merely suggestive and more courses are sometimes recommended than suffice to make up a technical minor or major in order that students may choose those courses which interest them the most.

Courses 7 and 8 are not included in these recommendations, as they must, in any case, precede the advanced courses, since they are required of all taking a major in Economics.

Students desiring merely a general acquaintance with Economics as part of a liberal education and as preparation for citizenship are recommended to take the general course and such others, amounting at least to a minor, as their interests may indicate.

### ECONOMICS

| In preparation for | Courses advised for a minor | Additional advised for a major |
|---|---|---|
| Law | 76, 145, 146, 191 | 43, 104, 143, 174 |
| Public Service | 2, 145, 146, 191 | 35-6, 101, 164 |
| Consular and Diplomatic Service | 2, 13, 72, 76, 101 | 34, 43, 143 |
| Journalism | 2, 43, 145, 146, 173, 191 | 101, 104, 143, 161, 164 |
| Engineering or Railway Service | 49, 145, 146, 173 | 34, 35-6, 142, 161, 174 |
| Chemistry of Manufactures | 2, 15, 76, 145, 161 | 34, 35-6, 101, 131 |
| Mining | 2, 72, 143, 145, 161 | 13, 22, 142 |
| Banking and Finance | 43, 48, 101, 143, 145 | 35-6, 41, 139, 142, 144, 255-56 |
| General Business | 2, 13, 43, 76, 143 | 34, 35-6, 142, 145 |
| Forestry or Agriculture | 13, 15, 18, 22 | 35-6, 43, 143, 173, 251-2 |
| Teaching Business Subjects | 2, 13, 43, 104 | 34, 35-6, 41 |
| Medicine | 2, 43, 164 | 34, 35-6, 42 |
| Social Service Work | 2, 161, 163 | 104, 164, 261-62 |
| The Ministry | 2, 161, 162 | 104, 164 |
| Public Accountancy | 34, 35-6, 132 | 43, 48, 49, 101, 131, 142, 145, 146, 253-54 |
| Insurance | 34, 35-6, 48, 49 | 142, 145, 146 |

### COURSES

*General Courses*

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 3-4 | 6† | General Economics | | Soph., jr., sr. | None‡ |
| | | 8 | MWF | 202MA | Blakey, et al. |
| | | 9 | TThS | Ar. | Blakey, et al. |
| | | 9 | MWF | 209MA | Paton |
| | | 3 | MWF | 209MA | Paton |
| | (Teachers) | 4 to 5:15 | MW | 109MA | Crosgrave |
| 3b | 3§ | General Economics (Part I, Second Semester) | | Soph., jr., sr. | None‡ |
| | | 11 | TThS | Ar | |
| | | 1 | MWF | 202MA | |

† Both semesters must be completed before credit is given.
§ Credit given only after Course 4 is completed.
‡ Not open to students in the vocational curriculum.

| | | | | | |
|---|---|---|---|---|---|
| 5 | 3 | Economic Development .... | | Soph., jr., sr. | None |
| | | See statement | | | |
| 7a or 7b | 3 | Principles of Economics... | | Soph., jr., sr. | None |
| | | See statement | | | |
| 8a | 3 | Economic Problems ..... | | Soph., jr. | 3 or 7 |
| | | 9 | TThS | 213MA | Blakey |
| | | 1 | MWF | 102MA | Blakey |
| 9a | 3 | Indust. Hist. Since 1750... | | Soph., jr., sr. | None |
| | | 10 | MWF | 102MA | Gray |
| 9b | 3 | Indust. Hist. Since 1750... | | Soph., jr., sr. | None |
| | | 10:45 | MWF | Ag.Col. | Gray |
| *101 | 3 | Statistics ..... | | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 | TThS | 303MA | Durand |
| *103 | 3 | Distribution of Wealth .... | | Jr., sr. | 3 or 7 |
| | | 10 | TThS | 213MA | Paton |
| *104 | 3 | Hist. of Economic Ideas... | | Jr., sr., grad. | 3 or 7 |
| | | 10 | TThS | 213MA | |
| *105-106 | None | Economic Conference ..... | | Sr., grad. | Accompanies seminars |
| | | See statement | | | |

*Production, Transportation, and Commerce*

| | | | | | |
|---|---|---|---|---|---|
| 2b | 3 | Industries and Commerce of the United States ..... | | Soph., jr., sr. | None |
| | | 11 | MWF | 209MA | McFall |
| | | Sections for Vocational Students ..... | | Fr. | None |
| | Lect. (All) | 9 | W | Ar | McFall |
| | Quiz (Sec. 1) | 9 | MF | Ar | McFall |
| | Quiz (Sec. 2) | Ar | Ar | Ar | McFall |
| | Quiz (Sec. 3) | Ar | Ar | Ar | James |
| | Quiz (Sec. 4) | Ar | Ar | Ar | James |
| | Quiz (Sec. 5) | Ar | Ar | Ar | McFall |
| 13 | 3 | Economic Geography of Foreign Countries ..... | | Soph., jr., sr. | 3 credits |
| | | 2 | MWF | 202MA | McFall |
| 72 | 3 | Economics of Civilization.. | | Jr., sr. | 6 credits, inc. 3 or 7 |
| | | See statement | | | |
| 76 | 3 | Commercial Policies ..... | | Jr., sr. | 6 credits, inc. 3 or 7 |
| | | 10 | TThS | 209MA | Blakey |
| *173 | 3 | Railway Problems ..... | | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 9 | TThS | 202MA | McFall |
| *174 | 3 | Railway Rate Regulation... | | Jr., sr., grad. | 173 |
| | | 9 | TThS | 213MA | McFall |

*Business Administration*

| | | | | | |
|---|---|---|---|---|---|
| 34 | 3 | Business Management ..... | | Soph., jr., sr. | 3 or 7 |
| | | 10 | TThS | 202MA | Harper |
| 35-36 | 6 | Accounting Principles ..... | | Soph., jr., sr. | None |
| Sec. 3 | Lect. & Quiz | 10 | WF | 301MA | Harper |
| Sec. 1 | Lect. & Quiz | 11 | TS | 301MA | Harper |
| Sec. 1 | Lab. | 11 & 12 | Th | 301MA | Harper |
| Sec. 4 | Lab. | 1 & 2 | Th | 301MA | Paton |
| Sec. 2 | Lect. & Quiz. | 2 | MF | 301MA | Harper |
| Sec. 2 | Lab. | 2 & 3 | W | 301MA | Harper |
| Sec. 3 | Lab. | 1 & 2 | T | 301MA | Harper |
| Sec. 4 | Lect. & Quiz | Ar | Ar | Ar. | Paton |
| 37 | 3 | Marketing of Products.... | | Soph., jr., sr. | 3 or 7 |
| | | 9 | TThS | 209MA | James |

| | | | | |
|---|---|---|---|---|
| 39 | 3 | Advertising, Salesmanship, and Commercial Credit... | Soph., jr., sr. | 3 or 7 |
| | | 1 MWF | 202MA | James |
| 88 | 3 | Retail Merchandising ..... | Jr., sr. | 6 cred., inc. 37 or 39 |
| | | 9 TThS | 202MA | James |
| *131 | 3 | Cost Accounting ..... | Jr., sr., grad. | 3 or 7 and 35-36 |
| | | 10 TThS | 301MA | Harper |
| *132 | 3 | Accounting Problems ..... | Jr., sr., grad. | 3 or 7 and 35-36 |
| | | See statement | | |
| *133 | 3 | Accounting Systems ..... | Sr., grad. | 35-36 and 131 or 132 |
| | | See statement | | |
| *134 | 3 | Auditing ..... | Sr., grad. | 35-36 and 131 or 132 |
| | | See statement | | |
| *139 | 3 | Bank Administration ..... | Jr., sr., grad. | 3 or 7 and 43, and consent of instructor |
| | | 2 and 3 TTh | 202MA | Ebersole |

*Finance*

| | | | | |
|---|---|---|---|---|
| 41 | 3 | Financial History ..... | Soph., jr., sr. | 3 or 7 |
| | | 10 TThS | 109MA | Blakey |
| 43a | 3 | Banking ..... | Soph., jr., sr. | 3 or 7 |
| | | 11 MWF | 202MA | Ebersole |
| 43b | 3 | Banking ..... | Soph., jr., sr. | 3 or 7 |
| | | 9 MWF | 109MA | Ebersole |
| 46 | 3 | Personal Insurance ..... | Jr., sr. | 3 or 7 |
| | | 10 TThS | 109MA | James |
| 47 | 3 | Property Insurance ..... | Jr., sr. | 3 or 7 |
| | | 10 TThS | 209MA | James |
| *142 | 3 | Investment & Speculation.. | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 MWF | 202MA | Ebersole |
| *143 | 3 | Money and Prices..... | Jr., sr., grad. | 3 or 7, and 41 or 43 |
| | | 10 MWF | 202MA | Ebersole |
| *144 | 3 | Commercial Crises ..... | Jr., sr., grad. | 3 or 7, or 43 or 143 |
| | | 10 MWF | 209MA | Ebersole |
| *145 | 3 | The Modern Business Corp. | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 9 MWF | 102MA | Gray |
| *146 | 3 | Public Utilities ..... | Jr., sr., grad. | 145 |
| | | 9 MWF | 102MA | Gray |
| *191 | 3 | Public Finance ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 TThS | 109MA | Blakey |
| *192 | 3 | State and Local Taxation.. | Jr., sr., grad. | 191 |
| | | 11 TThS | 109MA | Blakey |

*Economic Reforms*

| | | | | |
|---|---|---|---|---|
| *161 | 3 | Labor Problems ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 MWF | 213MA | Crosgrave |
| *163 | 3 | Econ. Conditions in Cities. | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | See statement | | |
| *164 | 3 | Econ. Functions of State.. | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 TThS | 209MA | Crosgrave |
| *165 | 3 | Hist. & Theory of Socialism | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 TThS | 213MA | Crosgrave |
| *166 | 3 | Trade Unionism and Allied Problems ..... | Jr., sr., grad. | 6 credits inc. 3 or 7 |
| | | 11 MWF | 213MA | Crosgrave |
| *168 | 3 | Wages ..... | Jr., sr., grad. | 164 or 166 and consent of instructor |
| | | See statement | | |

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 55-59.

## ENGLISH

Professors RICHARD BURTON, HARDIN CRAIG, FREDERICK KLAEBER, ELMER E. STOLL*, CARLETON BROWN; Associate Professor OSCAR W. FIRKINS; Assistant Professors JOSEPH W. BEACH, GEORGE N. NORTHROP.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, including Course 1-2.

*For a Major,* twenty-four credits, including Course 1-2, 3, 5, 8, 55.

*For B.A. with Honors,* the general requirements (page 15), a major in English, a reading knowledge of French, German, Italian, Greek, or Latin, and a final year's work in seminar for which a sequence shall have been specially arranged.

*For a Teacher's Certificate,* (a) English as the major subject of teaching: Rhetoric 1-2, either 11-12 or 15-16, and 41-42; English 1-2, and six additional hours, at least three hours of which shall be in courses numbered above 100. (b) English as the minor subject of teaching: Rhetoric 1-2, and either 11-12 or 15-16; English 1-2, and at least three additional hours.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1-2 | 6 | General Survey of Eng. Lit... | | Soph., jr., sr. | Rhet. 1-2 |
| | | 11 | MWF | 204F ¶ | |
| | | 11 | MWF | 124F ¶ | |
| | | 11 | MWF | 125F ¶ | |
| | | 11 | MWF | 205F ¶ | |
| | | 3 | MWF | 301F ¶ | |
| | | 3 | MWF | 204F ¶. | |
| | | 3 | MWF | 110F ¶ | |
| | | 3 | MWF | 205F ¶ | |
| 3 | 3 | Old English ..... | | Soph., jr., sr. | None |
| | | 9 | TThS | 205F | Klaeber |
| | | 10 | TThS | 204F | Firkins |
| 4 | 3 | Adv. Old English ..... | | Soph., jr., sr. | 3 |
| | | 9 | TThS | 205F | Klaeber |
| 5a | 3 | Chaucer ..... | | Soph., jr., sr. | 1-2 |
| | | 2 | MWF | 204F | Brown |
| 5b | 3 | Chaucer ..... | | Soph., jr., sr. | 1-2 |
| | | 10 | TThS | 204F | Firkins |
| 6 | 3 | Spenser ..... | | Soph., jr., sr. | 1-2 |
| | | 2 | MWF | 110F | Firkins |
| 8 | 1 | Hist. of English Language.... | | Jr., sr. | 3 |
| | | 3 | T | 206F | Klaeber |
| 55a | 3 | Shakespeare ..... | | Jr., sr. | 1-2 |
| | | 10 | MWF | 204F | Northrop |
| 55b | 3 | Shakespeare ..... | | Jr., sr. | 1-2 |
| | | 9 | TThS | 204F | Brown |
| 59 | 3 | Modern Drama ..... | | Sr. | 1-2, 55 |
| | | 11 | MWF | 301F | Burton |
| 60 | 3 | Adv. Modern Drama..... | | Sr. | 1-2, 55, 59 |
| | | 11 | MWF | 301F | Burton |
| 62 | 3 | Milton ..... | | Jr., sr. | 1-2 |
| | | See statement | | | |

* Absent on leave, 1916-17.

| | | | | | |
|---|---|---|---|---|---|
| 63 | 3 | 19th Century Literature..... | | Jr., sr. | 1-2 |
| | | See statement | | | |
| 66 | 3 | Browning-Tennyson ..... | | Jr., sr. | 1-2 |
| | | 10 | MWF | 301F | Burton |
| 67 | 3 | English Novel ..... | | Jr., sr. | 1-2 |
| | | 10 | MWF | 301F | Burton |
| 75 | 2 | Recent English Poetry ..... | | Jr., sr. | See statement |
| | | See statement | | | |
| 80a | 3* | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 3-4:30 | WF | 113Ed | Inglis |
| 80b | 3* | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 3-4:30 | WF | 113Ed | Inglis |
| 101 | 2 | Middle English ..... | | Jr., sr., grad. | 1-2 & 3 or 3 & 4 |
| | | 3 | TTh | 205F | Klaeber |
| 103 | 2 | Piers the Plowman..... | | Jr., sr., grad. | 1-2 & 3 or 3 & 4 |
| | | See statement | | | |
| 105 | 3 | 18th Century Poetry..... | | Jr., sr., grad. | 1-2 |
| | | 9 | MWF | 204F | Craig |
| 107 | 3 | 18th Century Prose..... | | Jr., sr., grad. | 1-2 |
| | | See statement | | | |
| 108 | 3 | Romantic Movement ..... | | Jr., sr., grad. | 1-2 |
| | | 9 | MWF | 204F | Craig |
| 109-110 | 6 | English Humorists ..... | | Jr., sr., grad. | 1-2 |
| | | See statement | | | |
| 111 | 3 | 17th Century Prose..... | | Jr., sr., grad. | 1-2 |
| | | See statement | | | |
| 112 | 3 | 17th Century Prose..... | | Jr., sr., grad. | 1-2 |
| | | 10 | MWF | 204F | Northrop |
| 113-114 | 6 | Drama ..... | | Sr., grad. | 12 credits |
| | | 3 | MWF | 206F | Firkins |
| 115 | 2 | English Idiom ..... | | Jr., sr., grad. | 1-2, 3 |
| | | 11 | TTh | 301F | Burton |
| 118 | 2 | Bible as Literature..... | | Jr., sr., grad. | 1-2 |
| | | See statement | | | |
| 119-120 | 6† | Principles of Lit. Criticism... | | Jr., sr., grad. | 1-2 |
| | | 11 | TThS | 204F | Firkins |
| 122 | 3 | American Literature ..... | | Jr., sr., grad. | 1-2 |
| | | See statement | | | |
| 123-124 | 4 | Seminar in Novelists..... | | Sr., grad. | See statement |
| | | 2-3 | T | 110F | Beach |
| 125-126 | 4 | Biography ..... | | Sr., grad. | See statement |
| | | 4-5 | T | 110F | Northrop |
| 128 | 3 | 17th Century Drama..... | | Jr., sr., grad. | 55 or 131 |
| | | See statement | | | |
| 131 | 3 | Elizabethan Drama ..... | | Jr., sr., grad. | 55 |
| | | See statement | | | |
| 133 | 2 | English and Scottish Popular Ballads ..... | | Jr., sr., grad. | 1-2 |
| | | 9 | TTh | 204F | Brown |
| 136 | 3 | Adv. Shakespeare ..... | | Jr., sr., grad. | 55a or 55b |
| | | 11 | TTh | 301F | Burton |
| 138 | 2 | History of Criticism..... | | Jr., sr., grad. | 12 hours |
| | | See statement | | | |
| 140 | 2 | Advanced Chaucer ..... | | Jr., sr., grad. | 1-2, 5a or 5b |
| | | 2 | MW | 204F | Brown |

* Carries credit only in the Department of Education.

† Both semesters must be completed before credit is given for the first semester.

| | | | | | | |
|---|---|---|---|---|---|---|
| 141 | 2 | Historical Grammar of English | | Jr., sr., grad. | 1-2 and 3 | |
| | | 2 | TTh | 205F | Klaeber | |
| 142 | 2 | Adv. Hist. Grammar of English | | Jr., sr., grad. | 1-2, 3, 141 | |
| | | 2 | TTh | 205F | Klaeber | |

80a. TEACHERS' COURSE. Methods of teaching English in high schools. Course of study, textbooks, and equipment; visits to Minneapolis and St. Paul high schools; theme-correcting. Open to juniors, seniors, and graduates qualifying for Practice Teaching. Credit only in Education. INGLIS.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 63-68.

## GEOLOGY AND MINERALOGY

Professor WILLIAM H. EMMONS; Associate Professor CLINTON R. STAUFFER; Assistant Professors FRANK F. GROUT, CHESSLEY J. POSEY; Instructors THOMAS M. BRODERICK, A. WALFRED JOHNSTON, TERENCE T. QUIRKE; in the General Extension Division, Assistant Professor EDWARD M. LEHNERTS.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits. It is strongly recommended that a field course be included when this is practicable.

*For B.A. with Honors,* Courses 11, 29, 105, 111, 124, and a field course: and twelve credits selected from the following courses:

57, 58, 108, 109 in Paleontology
106, 131, 132, 140 in Petrology
112, 124, 137, 140, 144 in Economic Geology
106, 112, 124 in Structural Geology
36, 39, 116, 118 in Geography

*For a Teacher's Certificate,* requirements the same as for a major, with an average of at least one and one-half honor points for each credit hour.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1 | 3† | General Geology ..... | | Soph., jr., sr. | None |
| | | 8 | MWF | 105P | Johnston |
| | | 10 | TThS | 110P | Emmons |
| | | 11 | MWF | 110P | Johnston |
| | | 3 | MWF | 110P | Johnston |
| 3 | 1 | Gen. Geology Laboratory... | | Soph., jr., sr. | Supports 1 |
| | | Ar | Ar | 112P | Johnston |
| 4 | 3 | Geology of Minnesota..... | | Soph., jr., sr. | Course 1 |
| | | 11 | MWF | 110P | Johnston |
| *5 | 3 | Economic Geology ..... | | Jr., sr. | 1 and 6 |
| | | 9 | MWF | 104P | Quirke |

| | | | | | |
|---|---|---|---|---|---|
| 6 | 3† | Historical Geology ..... | | Soph., jr., sr. | Course 1 |
| | | 10 | TThS | 110P | Emmons |
| | | 11 | TThS | 105P | Quirke |
| | | 3 | MWF | 105P | Quirke |
| 8 | 1 | Hist. Geology Laboratory... | | Soph., jr., sr. | Supports 4 and 6 |
| | | Ar | Ar | 112P | |
| 10 | 3 | Elements of Paleontology... | | Soph., jr., sr. | Course 1 |
| | | 10 | MWF | 104P | Stauffer |
| 11 | 3 | Paleontology ..... | | Jr., sr. | Course 6 |
| | | Lect. 9 | M | 104P | Stauffer |
| | | Lab. 2-4 | WF | 104P | Stauffer |
| 14 | 3 | Applied Geol. for Civil Eng. | | Soph., jr., sr. | Course 1 |
| | | 8 | TThS | 110P | Quirke |
| 15a or 15b | 1 | Minerals and Rocks ..... | | Jr., sr. | 1 |
| | | Ar | Ar | 112P | Grout |
| 21 | 3 | Elements of Mineralogy.... | | Soph., jr., sr. | See statement |
| | | Lec. 11 | TThS | 110P | Broderick |
| | | Lab. 8 | TThS | 100P | Broderick |
| | | Lab. 10 | TThS | 100P | Broderick |
| | | Lab. 2-5 | W | 100P | Broderick |
| 22 | 3 | Descriptive Mineralogy .... | | Soph., jr., sr. | 21 |
| | | Lect. 11 | TThS | 110P | Broderick |
| | | Lab. 10 | TThS | 100P | Broderick |
| 27a or 27b | 1 | Outlines of Mineralogy..... | | Jr., sr. | None |
| | | Ar | Ar | 100P | Grout |
| 29 | 3 | General Physiography ..... | | Soph., jr., sr. | None |
| | | 10 | TThS | 105P | Posey |
| 34 | 3 | Meteorology ..... | | Soph., jr., sr. | None |
| | | 8 | TThS | 105P | Posey |
| 35 | 1 | Laboratory Work ..... | | Soph., jr., sr. | See statement |
| | | Ar | Ar | Ar.P | Posey |
| 36 | 3 | Geog. of North America... | | Soph., jr., sr. | 1 or 29 |
| | | 10 | TThS | 105P | Posey |
| 37 | 3 | Phys. & Com. Geography... | | Freshmen | None |
| | | 9 | MWF | 110P | Posey |
| 39 | 3 | Geographic Influences ..... | | Soph., jr., sr. | See statement |
| | | 10 | MWF | 105P | Posey |
| *55 | 2 | Teachers' Course in Geog.. | | Jr., sr., grad. | See statement |
| | | 8 | ThS | 105P | Posey |
| *57 | 3 | Paleontology ..... | | Jr., sr. | 6 |
| | | 9-11 | TThS | 104P | Stauffer |
| *58 | 3 | Paleontology ..... | | Jr., sr. | 57 |
| | | 9-11 | TThS | 104P | Stauffer |
| *61 | 3 | Physical Mineralogy ..... | | Jr., sr. | 22 |
| | | Ar | Ar | Ar.P | Grout |
| *65 | 3 | Morphology of Minerals ... | | Jr., sr. | 22 |
| | | Ar | Ar | Ar.P | Grout |
| *105 | 3 | Elements of Rock Study... | | Jr., sr., grad. | See statement |
| | | 2-4 | TTh | 112P | Grout |
| *106 | 3 | Petrology ..... | | Jr., sr., grad. | 105 |
| | | 2-4 | TTh | 112P | Grout |
| *108 | 3 | Paleontologic Practice ..... | | Jr., sr., grad. | 58 |
| | | 2-4 | MWF | 107P | Stauffer |
| *109 | 3 | Advanced Paleontology .... | | Jr., sr., grad. | 58 |
| | | 8-10 | MWF | 107P | Stauffer |
| *110 | 3 | Advanced Paleontology .... | | Jr., sr., grad. | 109 |
| | | 8-10 | MWF | 107P | Stauffer |

† Geology 1 and 6 constitute a year's course; both semesters must be completed before credit is given for the first semester.

| | | | | | |
|---|---|---|---|---|---|
| *111 | 4 | Ore Deposits..... | | Sr., grad. | 6, 22, 105 |
| | | 8 | TWThF | 110P | Emmons |
| *112 | 4 | Problems in Ore Deposits.. | | Sr., grad. | 111 |
| | | 2-6 | W | 104P | Emmons |
| *116 | 3 | Geog. of Latin America.... | | Jr., sr., grad. | 1, 29 or 31-32 & 3 |
| | | 9 | MWF | 105P | Posey credits in Geog. |
| *118 | 3 | Geography of Eurasia ..... | | Jr., sr., grad. | Same as for 116 |
| | | 9 | MWF | 105P | Posey |
| *124 | 3 | Struct. & Metamorph. Geol. | | Sr., grad. | 6, 22, 105 |
| | | 10 | TThS | 112P | Johnston |
| *131-*132 | 6 | Advanced Petrology ..... | | Jr., sr., grad. | 106 |
| | | 9-11 | W | 112P | Grout |
| *137 | 3 | Testing Econ. Minerals.... | | Jr., sr., grad. | 6, 22, 105 |
| | | Lect. 11 | MW | 100P | Grout |
| | | Lab. 2-4 | W | 100P | Grout |
| *140 | 3 | Applied Petrology ..... | | Jr., sr., grad. | See statement |
| | | 2-4 | TTh | 112P | Grout |
| *144 | 3 | Construction of Geol. Maps. | | Jr., sr., grad. | 1, 6 |
| | | Ar | Ar | 112P | Quirke |
| *151 | 3 | Advanced General Geology. | | Jr., sr., grad. | 6 |
| | | 11 | MWF | 104P | Stauffer |
| *152 | 3 | Advanced General Geology. | | Jr., sr., grad. | 151 |
| | | 11 | MWF | 104P | Stauffer |
| *160 | 6 | Field Geology ..... | | Jr., sr., grad. | See statement |
| *188 | 6 | Field Work in Geography.. | | Jr., sr., grad. | See statement |

55. TEACHERS' COURSE IN GEOGRAPHY. A critical study of materials and methods of teaching secondary school geography. The relation of human activities to environment will be emphasized. For teachers of high school geography. Prerequisites: Geology 1 or 29, and 36 or 116 or 118.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 68-74.

## GERMAN

Professor CARL SCHLENKER; Assistant Professors OSCAR C. BURKHARD, WALTER R. MYERS; Instructors JAMES DAVIES, LYNWOOD G. DOWNS, J. THEODORE GEISSENDOERFER, ARTHUR R. GRAVES, ALFRED E. KOENIG, HAROLD W. SOULE, RICHARD WISCHKAEMPER, EDWIN H. ZEYDEL; Teaching Fellow ARNOLD W. SHUTTER.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, not including Course 1.
*For a Major,* twenty-four credits.
*Teacher's Certificate in German*
For a *Minor* recommendation, a minimum of fourteen credits.†
Required courses are German 29-30, 31-32, and 59-60.

† Means a minimum of 14, and a maximum of 20, credits.

For a *Major* recommendation, a minimum of twenty-six credits.‡

Required courses are German 29-30, 31-32, 53-54, 55-56, and 59-60.

German 57-58 is strongly recommended.

German 1 and 3 shall not be counted toward either a minor or major recommendation.

To obtain either a minor or major recommendation the student must obtain an average of one and one-half honor points for each credit hour for all German courses taken.

The prerequisites for German 59-60 (Teachers' Course) are to read German 29-30 and 31-32 or German 53-54. This will enable most students to take the Teachers' Course in the junior year. Practice teaching will in that case become a senior subject for nearly all students and enable the College of Education to make a more equal division between the two semesters of students who elect to practice in teaching German.

‡ Means a minimum of 26 and a maximum of 30, credits; for a majority of students. Inferior students and those who come without German will in cases exceed the maximum; but these will be students who should be discouraged from trying for a recommendation.

## COURSES

| No. | Credit | Title | | Offered to | | Prereq. courses |
|---|---|---|---|---|---|---|
| 1a | 6 | Beginning ..... | | All | | None |
| | | 8 | MTWThFS | 207F | ¶ | |
| | | 9 | MTWThFS | 207F | ¶ | |
| | | 10 | MTWThFS | 207F | ¶ | |
| | | 11 | MTWThFS | 207F | ¶ | |
| 1b | 6 | Beginning ..... | | All | | None |
| | | 11 | MTWThFS | 209F | ¶ | |
| 3a | 6 | Intermediate ..... | | All | | 1a or 1b |
| | | 11 | MTWThFS | 209F | ¶ | |
| 3b | 6 | Intermediate ..... | | All | | 1a or 1b |
| | | 8 | MTWThFS | 207F | ¶ | |
| | | 9 | MTWThFS | 207F | ¶ | |
| | | 10 | MTWThFS | 207F | ¶ | |
| | | 11 | MTWThFS | 207F | ¶ | |
| 5a-6b | 6† | Prose and Poetry ..... | | Fr., soph. | | 2 yrs. prep. German |
| | | 8 | TThS | 209F | ¶ | |
| | | 9 | MWF | 212F | ¶ | |
| | | 10 | MWF | 209F | ¶ | |
| | | 10 | TThS | 212F | ¶ | |
| | | 11 | MWF | 109F | ¶ | |
| | | 11 | TThS | 109F | ¶ | |
| | | 2 | MWF | 213F | ¶ | |
| | | 3 | MWF | 209F | ¶ | |
| 5b-6a | 6† | Prose and Poetry ..... | | Fr., soph. | | 2 yrs. prep. German |
| | | 2 | MWF | 209F | ¶ | |
| 7-8 | 6† | Drama ..... | | Fr., soph., jr., sr. | | 5-6 or 4 yr. prep. Ger. |
| | | 9 | TThS | 212F | Burkhard | |
| | | 10 | MWF | 213F | Schlenker | |
| | | 11 | TThS | 212F | Davies | |
| | | 3 | MWF | 207F | ¶ | |
| 9-10 | 6† | Historical Prose ..... | | Fr., soph., jr., sr. | | 5-6 or 4 yr. prep. Ger. |
| | | 9 | MWF | 205F | Geissendoerfer | |

† Both semesters must be completed before credit is given for either semester.

| | | | | | | |
|---|---|---|---|---|---|---|
| 11-12 | 6† | Rapid Reading ..... | | | Soph., jr., sr. | 3a or 3b |
| | | 9 | TThS | 110F | Koenig | |
| | | 10 | TThS | 213F | Graves | |
| | | 11 | MWF | 121F | Davies | |
| | | 2 | MWF | 209½F | Soule | |
| 21-22 | 6† | Scientific Intermediate ..... | | | Fr., soph. | 3a or 3b or 2 years prep. German |
| | | 11 | TThS | 213F | Geissendoerfer | |
| 23-24 | 6† | Scientific Advanced ..... | | | Soph., jr. | 5-6 or 21-22 |
| | | 11 | MWF | 213F | Wischkaemper | |
| 25-26 | 2† | Elementary Comp. ..... | | | Fr., soph., jr. | See note a below |
| | | 9 | S | 209½F | Zeydel | |
| | | 10 | S | 25F | Soule | |
| | | 2 | M | 207F | Wischkaemper | |
| 27-28 | 2† | Elementary Conversation .... | | | Fr., soph., jr. | See note a below |
| | | 8 | WF | 209½F | Soule | |
| | | 9 | TTh | 209½F | Zeydel | |
| | | 10 | TTh | 5F | Downs | |
| | | 11 | WF | 207F | Wischkaemper | |
| 29-30 | 2† | Advanced Conversation ..... | | | Soph., jr., sr. | See note b below |
| | | 9 | WF | 209½F | Koenig | |
| | | 9 | WF | 107F | Zeydel | |
| | | 10 | TTh | 110F | ¶ | |
| | | 10 | TTh | 25F | Soule | |
| 31-32 | 2† | Intermed. Composition ..... | | | Soph., jr., sr. | See note b below |
| | | 9 | M | 209½F | Koenig | |
| | | 9 | M | 107F | Zeydel | |
| | | 10 | S | 110F | ¶ | |
| | | 10 | S | 209F | Wischkaemper | |
| 51 | 2 | Faust, Part I ..... | | | Soph., jr., sr. | 7-8, or 9-10 or 11-12 or 23-24 |
| | | 11 | WF | 209½F | Schlenker | |
| 52 | 2 | Faust, Part II ..... | | | Soph., jr., sr. | 51 |
| | | 11 | WF | 209½F | Schlenker | |
| 53 | 3 | Survey Through Classic Per. | | | Soph., jr., sr. | 7-8, or 9-10 or 11-12, or 23-24 |
| | | 9 | MWF | 209F | Burkhard | |
| | | 9 | TThS | 209F | Myers | |
| 54 | 3 | Survey Since Classic Per.... | | | Soph., jr., sr. | 53 |
| | | 9 | MWF | 209F | Burkhard | |
| | | 9 | TThS | 209F | Myers | |
| 55-56 | 2† | Advanced Composition ..... | | | Jr., sr. | 31-32 |
| | | 3 | M | 209½F | Myers | |
| 57-58 | 2† | Oral Diction ..... | | | Jr., sr. | See statement |
| | | 3 | WF | 209½F | Koenig | |
| 59-60 | 2† | Teacher's Course ..... | | | Jr., sr. | 29-30 & 31-32 or 53-54 |
| | | 4 | F | 209F | Schlenker | |
| 61 | 2 | Romantic School ..... | | | Jr., sr. | 7-8 or 9-10 or 11-12, or 23-24 |
| | | 11 | TTh | 209½F | Schlenker | |
| 62 | 2 | Drama of Last 30 Years.... | | | Jr., sr. | 2 cr. in starred courses |
| | | 11 | TTh | 209½F | Schlenker | |
| 63 | 2 | Schiller Poetry ..... | | | Jr., sr. | 7-8 or 9-10 or 11-12, or 23-24 |
| | | 10 | TTh | 209F | Wischkaemper | |
| 64 | 2 | Goethe Poetry ..... | | | Jr., sr. | 7-8 or 9-10 or 11-12, or 23-24 |
| | | 10 | TTh | 209F | Wischkaemper | |

| | | | | | |
|---|---|---|---|---|---|
| 107-108 | 4† | Middle High German ..... | Jr., sr., grad. | 4 cr. in starred courses | |
| | | 4 MW | 209F | ¶ | |
| 109-110 | 4† | Hist. of German Lang. .... | Jr., sr., grad. | 4 cr. in starred courses | |
| | | See statement | | | |
| 119-120 | 4† | Drama of Schiller..... | Sr., grad. | 4 cr. in starred courses | |
| | | 2-4 Th | 209F | Myers | |
| 127-128 | 4† | 18th and 19th Cent. Lyric.. | Sr., grad. | 4 cr. in starred courses | |
| | | 2-4 M | | Davies | |
| 129-130 | 4† | Der Deutsche Roman ..... | Sr., grad. | 4 cr. in starred courses | |
| | | See statement | | | |
| 131-132 | 4† | Die Novelle ..... | Sr., grad. | 4 cr. in starred courses | |
| | | 2-4 W | 212F | Burkhard | |
| 133-134 | 4† | English Influences ..... | Sr., grad. | 4 cr. in starred courses | |
| | | See statement | | | |
| 137-138 | 4† | Grillparzer ..... | Sr., grad. | 4 cr. in starred courses | |
| | | 4-6 F | 206F | Geissendoerfer | |
| 143-144 | 4† | Heine ..... | Sr., grad. | 4 cr. in starred courses | |
| | | 4 TTh | 209F | Graves | |
| 225-226 | 4† | Literary Problems ..... | Honors & grads. | | |
| | | See statement | | | |
| 231-232 | 4† | Faust Seminar ..... | Honors & grads. | | |
| | | 2-4 T | 209F | Schlenker | |

a. Only students who are taking or who have taken Course 5-6 or Course 21-22 may elect the supplementary Courses 25-26 and 27-28, either one or both together. But students electing Course 11-12 may take Course 25-26. No credit will be granted to students who are taking or have taken a course numbered above 50.

b. Only students who are taking or who have taken Course 7-8 or Courses 9-10 or Course 11-12 or Course 23-24 may elect the supplementary courses 29-30 and 31-32, either one or both together. Students electing Course 11-12 should take Course 31-32 only after consultation with the instructor in charge.

c. Credit will be granted for either Course 5-6 or Course 21-22 but not for both.

d. Credit for only one of the following courses will be granted: Courses 7-8, 9-10, 11-12, 23-24.

59-60. TEACHERS' COURSE. Lectures, readings, and reports; observation of classes. SCHLENKER.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 74-80.

## GREEK

Professors JOHN CORRIN HUTCHINSON, CHARLES ALBERT SAVAGE.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits (exclusive of Courses 59 to 64 inclusive).

### COURSES

| No. | Credit | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2 | 10 | First Year Greek..... | Fr., soph., jr., sr. | None |
| | | 9 TWThFS | 115F ¶ | |
| | | 11 TWThFS | 114F ¶ | |
| 3-4 | 6 | Anabasis-Iliad ..... | Fr., soph., jr., sr. | 1-2 |
| | | 10 MWF | 114F | Savage |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | 3 | Dramatic Poetry | | | Soph., jr., sr. | 3-4 |
| | | 9 | TThS | | 114F | Savage |
| 51 | 3 | Philosophy | | | Jr., sr. | 3-4 |
| | | 10 | TThS | | 113F | Hutchinson |
| 52 | 3 | Oratory | | | Jr., sr. | 3-4 |
| | | 10 | TThS | | 114F | Savage |
| 53-54 | 2 | Composition | | | Sr. | 51-52 |
| | | 3 | F | | 113F | Hutchinson |
| 101 | 3 | Lyric Poetry | | | Sr., grad. | 51 or 52 |
| | | 10 | MWF | | 113F | Hutchinson |
| 102 | 3 | Tragedy | | | Sr., grad. | 7 or 101 |
| | | 9 | MWF | | 114F | Savage |
| 103 | 3 | Septuagint | | | Sr., grad. | 51 |
| | | 11 | MWF | | 113F | Hutchinson |
| 104 | 3 | New Testament | | | Sr., grad. | 51 |
| | | 11 | MWF | | 113F | Hutchinson |
| | | *Courses Open to All—No Knowledge of Greek Required* | | | | |
| 59 | 1 | Greek Architecture | | | Jr., sr. | None |
| | | 3 | W | | 114F | Hutchinson |
| 60 | 1 | Sculpture | | | Jr., sr. | None |
| | | 3 | W | | 114F | Hutchinson |
| 61 | 2 | Drama | | | Jr., sr. | None |
| | | 2 | TTh | | 114F | Savage |
| 62 | 2 | Literature and Life | | | Jr., sr. | None |
| | | 2 | TTh | | 114F | Savage |
| 63-64 | 1 | Mythology | | | Jr., sr. | None |
| | | 3 | Th | | 114F | Savage |

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 80-81.

## HISTORY

Professors Guy Stanton Ford, Carl Lotus Becker, William Stearns Davis, Albert Beebe White; Associate Professor Wallace Notestein; Assistant Professors Solon Justus Buck, August Charles Krey; Instructor Wayne E. Stevens; Teaching Fellows Charles Byron Kuhlmann, Ruth Elizabeth Marshall.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* see general statement (page 15).

*For a Teacher's Certificate,* eighteen credits in History, including at least three credits in intensive courses. In addition the student must take History 54.

The Departments of History, Economics, Political Science, Sociology, and Anthropology constitute a social science group. The subjects are closely inter-related, and are of especial importance to students who intend to engage in law, business, public service at home or abroad, journalism, and the work of charities and corrections, or to give instruction in one of the social sciences. Students who are interested in any one of the departments of the social science group ought to be familiar with at least the elements of the subjects offered in the other departments. A student

who takes his major in any one of them ought to have more than the elements of the others.

COURSES

| No. | Credit | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1-2 | 6 | Med. and Modern Europe... | All | None |
| | | 1 (Lect.) W | 30Ph | Ford, Krey |
| | | 8 (Rec.) TS | 111Lib | |
| | | 9 (Rec.) MW | 3F | |
| | | 9 (Rec.) TS | 111Lib | |
| | | 10 (Rec.) MW | 3F | |
| | | 11 (Rec.) MF | 5F | |
| | | 11 (Rec.) TS | 111Lib | |
| | | 3 (Rec.) MF | 111Lib | |
| 2a-1b | 6 | Med. and Modern Europe... | All | None |
| | | 10 TThS | 301F | |
| 3-4 | 6 | English to 1783 ..... | All | None |
| | | 1 (Lect.) M | 301F | White |
| | | 1 (Lect.) M | 308F | Notestein |
| | | 9 WF | 112Lib | |
| | | 9 TTh | 112Lib | |
| | | 10 WF | 112Lib | |
| | | 10 TTh | 112Lib | |
| | | 11 WF | 112Lib | |
| | | 11 TTh | 112Lib | |
| | | 2 WF | 112Lib | |
| | | 3 WF | 112Lib | |
| 5-6 | 6 | American History ..... | Soph., jr., sr. | 6 credits |
| | | 10 (Lect.) M | 110F | Becker, Buck |
| | | 10 WF | 111L | |
| | | 10 ThS | 15F | |
| | | 11 WF | 3F | |
| 7 | 3 | English History, 1750-1916.. | Soph., jr., sr. | 6 credits |
| | | 2 MWF | 25F | Notestein |
| 9 | 3 | National Movements ..... | Soph., jr., sr. | 6 credits |
| | | 11 MWF | 111Lib | Ford |
| 10 | 3 | Europe in 19th Century .... | Soph., jr., sr. | 6 credits |
| | | See statement | | |
| 13 | 3 | Medieval Civilization ..... | Soph., jr., sr. | 6 credits |
| | | See statement | | |
| 14 | 3 | Renaissance and Reform. ... | Soph., jr., sr. | 6 credits |
| | | 11 MWF | 25F | Krey |
| *21 | 3 | Topics in Greek History.... | Jr., sr. | 9 credits |
| | | See statement | | |
| *23 | 3 | Topics in Roman History... | Jr., sr. | 9 credits |
| | | See statement | | |
| *56-57 | 3 | Teachers' Course ..... | Jr., sr. | See statement |
| | | 4 MW | 111Lib | Krey |
| *101 | 3 | French Revolution ..... | Jr., sr., grad. | 9 credits |
| | | 2-330 TTh | 111Lib | Becker |
| *104 | 3 | The Near East ..... | Jr., sr., grad. | 9 credits |
| | | 10 TThS | 111Lib | Davis |
| *121-122 | 6 | History of Greece..... | Jr., sr., grad. | See statement |
| | | See statement | | |
| *123-124 | 6 | History of Rome..... | Jr., sr., grad. | See statement |
| | | 3 MWF | 25F | Davis |
| *125 | 3 | History of Old Orient..... | Jr., sr., grad. | 9 credits |
| | | 10 TThS | 111Lib | Davis |

| | | | | | |
|---|---|---|---|---|---|
| *133-134 | 6 | Ancient Civilization ..... | | Jr., sr., grad. | See statement |
| | | 11 | TThS | 3F | Davis |
| *136 | 3 | Outlines of Prussian History. | | Jr., sr., grad. | 9 credits |
| | | 11 | MWF | 111Lib | Ford |
| *137 | 3 | English Constitutional Hist... | | Jr., sr., grad. | 9 credits (inc. 3-4) |
| | | 4-5:30 | TTh | 218Lib | White |
| *141 | 3 | West in American History.. | | Jr., sr., grad. | 9 credits (inc. 5-6) |
| | | 3 | MWF | 218Lib | Buck |
| *144 | 3 | History of Minnesota ..... | | Jr., sr., grad. | 9 credits (inc. 5-6) |
| | | 3 | MWF | 219Lib | Buck |
| *154 | 3 | American Revolution ..... | | Sr., grad. | 12 credits (inc. 5-6) |
| | | 2-3:30 | TTh | 218Lib | Becker |
| *162 | 3 | Beginnings of Parliament... | | Jr., sr., grad. | See statement |
| | | 4-5:30 | TTh | 218Lib | White |
| *163 | 3 | English Judicial System ..... | | Jr., sr., grad. | See statement |
| | | See statement | | | |
| *171-172 | 6 | German History ..... | | Sr., grad. | See statement |
| | | See statement | | | |
| *181 | 3 | English Backgrounds of American History ..... | | Sr., grad. | 12 credits (inc. 3-4) |
| | | 4-5:30 | WF | 218Lib | Notestein |
| *182 | 3 | English Colonization ..... | | Sr., grad. | 12 cr. (inc. 5-6) or 181 |
| | | 4-5:30 | WF | 218Lib | Notestein |
| *184 | 3 | Stuart Period ..... | | Sr., grad. | See statement |
| | | See statement | | | |
| *191 | 3 | Age of the Crusades ..... | | Sr., grad. | See statement |
| | | 1:30-3 | TTh | 218Lib | Krey |

56-57. THE TEACHING OF HISTORY AND GOVERNMENT. Open only to students who have eighteen credits in History, including a starred course. Deals chiefly with the practical problems of teaching history and government in the secondary schools. Students planning to teach government must have nine credits in Political Science. KREY, et al.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 81-86.

## HUMAN PHYSIOLOGY

Professor ELIAS P. LYON; Associate Professors RICHARD OLDING BEARD, FREDERICK H. SCOTT; Assistant Professors JOHN E. MCCLENDON, M. RUSSELL WILCOX; Instructors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE; Assistants EDWARD D. ANDERSON, ALBERT M. SNELL, FRED S. RICHARDSON.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, which may include Animal Biology, 1-2.

*For a Major,* Animal Biology 1-2 and eighteen credits, including Physiology 102, 103, and 104. In these eighteen credits may be included Anatomy 101 and Animal Biology 15-16.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1-2 | 2 or 4 | Physiology and Hygiene.... | | All | None |
| | | 9-12 | S | | |

| | | | | | |
|---|---|---|---|---|---|
| 3a or 3b | 3* | Elem. Human Physiology... | | Soph., jr., sr. | 1 yr. Chem., ½ yr. Biol. |
| | | 1:30-3:30 | T | 214MH | Beard or Lyon, et al. |
| | | 1:30-5:00 | Th | | |
| 4 | 4* | Elementary Physiology ..... | | Jr., sr. | Elem. Chem. & Biol. or Anatomy |
| | | 8-10 | T | 214, 301MH | Beard, et al. |
| | | 8-12 | Th | | |
| | | 8-9 | S | | |
| 5 | 3* | Elementary Physiology ..... | | Jr., sr. | Elem. Chem. & Biol. or Anatomy |
| | | 9-11 | T | 214, 301MH | Lyon, et al. |
| | | 9-12 | Th | | |
| 6 | 3* | Elem. Physiol. Chemistry .. | | Soph., jr., sr. | Elem. Chem. & Biol. or Anatomy |
| | | 10-12 | T | 214, 310MH | Pettibone, et al. |
| | | 9-12 | S | | |
| 7 | 2* | Elem. Physiol. Chemistry... | | Soph., jr., sr. | Elem. Chem. & Biol. or Anatomy |
| | | 11-12 | T | 214, 310MH | Pettibone, et al. |
| | | 9-12 | S | | |
| 102 | 5 | Physiologic Chemistry ..... | | Jr., sr., grad. | Organ. Chem. |
| | | 8-11 | MW | 214, 310MH | Pettibone, et al. |
| | | 8-12 | F | | |
| 103 | 4 | Physiology, Muscle, etc. .... | | Jr., sr., grad. | An. Biol. 1-2 |
| | | 1-3:00 | M | 214, 310MH | Scott, et al. |
| | | 1-4:30 | W | | |
| | | 1-3:30 | F | | |
| 104 | 4 | Physiol., Nervous System, etc. | | Jr., sr., grad. | An. Biol. 1-2 |
| | | 1-3:00 | M | 214, 310MH | Lyon, et al. |
| | | 1-4:30 | W | | |
| | | 1-3:30 | F | | |
| 151-152 | 6 | Physiologic Chemistry ..... | | Jr., sr., grad. | Organ. Chem. |
| | | 1-4 | TTh | 305, 310MH | Kingsbury, et al. |

* Students may not receive credit for any two of Courses 3, 4, and 5; or for both 6 and 7.

1-2. HUMAN PHYSIOLOGY AND HYGIENE. A course in the essentials of human physiology and hygiene, planned to afford teachers an adequate knowledge of the human subject whom they are engaged in teaching. Offered to public school teachers and others. **BEARD and** Assistants.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 89-92.

## LATIN

Professors JOSEPH B. PIKE, JOHN E. GRANRUD.

### REQUIREMENTS OF THE DEPARTMENT

*For a Major,* eighteen credits for those entering with four years of Latin; twenty-four credits for all others.

*For a Minor Teacher's Recommendation,* Courses 5-6, 57, 58, and 101; *for a Major Teacher's Recommendation,* these same courses with the ad-

dition of Course 102, with an average of at least one and one-half honor points per credit hour.

*For B.A. with Honors.* The general requirements (page 15), and a fair reading knowledge of German or French or Greek. Six credits in Latin a semester during the junior and senior years are to be selected from Courses 57 to 204. (Students who do not desire a recommendation for teaching Latin may, by selecting courses that are given in alternate years, secure enough work for the honors course without being obliged to take Courses 101 and 102.) Instead of taking all the work indicated above in Latin, the student may substitute six credits in Greek (third-year Greek or above), or six credits in Greek or Roman History, or six credits in ancient Philosophy.

COURSES

| No. | Credit | Title | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1 | 3 | Selections from Latin Authors. | All | 2 or 3 yrs. Latin |
| | | 9 TThS | 107F ¶ | |
| 2 | 3 | Selections from Latin Authors. | All | 2 or 3 yrs. Latin |
| | | 9 TThS | 107F ¶ | |
| 5 | 3 | Livy ..... | All | Courses 1 & 2 or 4 years Latin |
| | | 10 TThS | 107F ¶ | |
| 6 | 3 | Plautus and Terence ..... | All | Courses 1 & 2 or 4 years Latin |
| | | 10 TThS | 109F ¶ | |
| 57 | 3 | Horace ..... | Soph., jr., sr. | 6 |
| | | 9 MWF | 109F | Pike |
| 58 | 3 | Pliny ..... | Soph., jr., sr. | 57 |
| | | 9 MWF | 109F | Pike |
| 101 | 3 | Advanced Caesar ..... | Jr., sr. | 58 |
| | | 9 TThS | 109F | Pike |
| 102 | 3 | Advanced Vergil ..... | Jr., sr. | 101 |
| | | 9 TThS | 109F | Pike |
| 104 | 2 | Latin Writing ..... | Jr., sr. | 58 |
| | | See statement | | Pike |
| 105 | 3 | Roman Elegy ..... | Jr., sr., grad. | 58 |
| | | See statement | | Granrud |
| 106 | 3 | Roman Novel ..... | Jr., sr., grad. | 58 |
| | | 10 MWF | 109F | Pike |
| 107 | 3 | Letters of Cicero ..... | Jr., sr., grad. | 58 |
| | | 11 MWF | 107F | Granrud |
| 108 | 3 | Tacitus ..... | Jr., sr., grad. | 58 |
| | | See statement | | Granrud |
| 110 | 3 | Roman Satire ..... | Jr., sr., grad. | 58 |
| | | 11 MWF | 107F | Granrud |
| 9 | 1 | Roman Architecture ..... | Jr., sr. | None |
| | | 11 S | 107F | Granrud |
| 10 | 1 | Roman Art ..... | Jr., sr. | None |
| | | 11 S | 107F | Granrud |
| 201-202 | 3 | Lucretius ..... | Grad.& honor stu. | Consult department |
| | | See statement | | Pike |
| 203-204 | 3 | Seneca ..... | Grad.& honor stu. | Consult department |
| | | 3 and 5 T | 109F | Pike |
| 205-206 | 3 | Cicero ..... | Grad.& honor stu. | Consult department |
| | | 3 and 5 Th | 107F | Granrud |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3a | 3 | Higher Algebra, Part II ..... | | Fr., soph. | | Prep. higher Algebra |
| | | 8 | TThS | 104F | ¶ | |
| | | 10 | MWF | 104F | ¶ | |
| | | 10 | TThS | 104F | ¶ | |
| | | 2 | MWF | 101F | ¶ | |
| | | 3 | MWF | 102F | ¶ | |
| 3b | 3 | Higher Algebra, Part II ..... | | Fr., soph. | | Prep. higher Algebra |
| | | 8 | MWF | 104F | ¶ | |
| 4a | 3 | Trigonometry ..... | | Fr., soph. | | 3 |
| | | 8 | MWF | 104F | ¶ | |
| 4b | 3 | Trigonometry ... ..... | | Fr., soph. | | 3 |
| | | 8 | TThS | 104F | ¶ | |
| | | 10 | MWF | 104F | ¶ | |
| | | 10 | TThS | 104F | ¶ | |
| | | 2 | MWF | 101F | ¶ | |
| | | 3 | MWF | 102F | ¶ | |
| 6 | 2 | Solid Geometry ..... | | Soph., jr., sr. who have not had Solid Geometry | | 1-2 or 3-4 or 2-9 |
| | | 11 | WF | 101F | | Bussey |
| 7 | 3 | Plane Analyt. Geom. ..... | | Soph., jr., sr. | | 2 or 4 |
| | | 9 | TThS | 102F | | Bussey |
| | | 2 | MWF | 102F | | Mikesh |
| 9a | 5 | Pl. and Sol. Anal. Geometry ..... | | Soph., jr., sr. | | 2 or 4 |
| | | 9 | TWThFS | 101F | | Shumway |
| 9b | 5 | Pl. and Sol. Anal. Geometry..... | | Fr., soph., jr., sr. | | 2 or 4 |
| | | 9 | TWThFS | 104F | ¶ | |
| | | 10 | TWThFS | 105F | ¶ | |
| 11a | 3 | Differential Calculus ..... | | Soph., jr., sr. | | 7 or 9 |
| | | 11 | TThS | 102F | | Underhill, Slobin |
| 11b | 3 | Differential Calculus ..... | | Soph., jr., sr. | | 7 or 9 |
| | | 9 | TThS | 102F | | Bussey |
| | | 2 | MWF | 102F | | Barton |
| 51a | 3 | Integral Calculus ..... | | Soph., jr., sr. | | 11 |
| | | 11 | TThS | 101F | | Bauer |
| 51b | 3 | Integral Calculus ..... | | Soph., jr., sr. | | 11 |
| | | 11 | TThS | 102F | | Underhill |
| 54a | 2 | Teachers' Course ..... | | Jr., sr. | | 11 |
| | | 3 | TTh | 115Ed | | Reeve |
| 54b | 2 | Teachers' Course ..... | | Jr., sr. | | 11 |
| | | 3 | TTh | 115Ed | | Reeve |
| 62 | 3 | Theory of Equations ..... | | Jr., sr. | | 11 |
| | | 2 | MWF | 125F | | Shumway |
| 71 | 3 | Solid Analytical Geometry ..... | | Jr., sr. | | 11 |
| | | 9 | MWF | 102F | | Bussey |
| 102 | 3 | Adv. Plane Analytical Geometry. (Not offered in 1916-17) | | Jr., sr., grad. | | 11 |
| 104 | 3 | Modern Synthetic Geometry ..... | | Jr., sr., grad. | | 11 |
| | | 9 | MWF | 102F | | Bussey |
| 107 | 3 | Adv. Differential Calculus ..... | | Jr., sr., grad. | | 51 |
| | | 11 | MWF | 102F | | Underhill |
| 108 | 3 | Adv. Integral Calculus ..... | | Jr., sr., grad. | | 51, 101 |
| | | 11 | TThS | 101F | | Bauer |

Any of the following courses for which a sufficient number of students apply will be given in 1916-17:

| | | | | |
|---|---|---|---|---|
| 106a or 106b | 3 | Differential Equations ... | Sr., grad. | 51 |
| 119a or 119b | 3 | Modern Higher Algebra.. | Sr., grad. | 51 |
| 125-126 | 6 | Differential Geometry ... | Sr., grad. | 51 |

101. ADVANCED COURSE IN CAESAR. Teachers' Course. Selections from books five to seven of the Gallic War; the principles of indirect discourse; intermediate Latin composition; class drill and discussion of various problems connected with secondary school work in Latin. PIKE.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 92-95.

## MATHEMATICS

Professor GEORGE N. BAUER, FRANCIS P. LEAVENWORTH; Associate Professor WILLIAM H. BUSSEY; Assistant Professors ROYAL R. SHUMWAY, HERMON L. SLOBIN, ANTHONY L. UNDERHILL, WILLIAM D. REEVE; Instructors RALPH M. BARTON, CLARENCE MCCORMICK; Assistants CARL HOLZINGER, VERA WRIGHT.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve or sixteen credits according as the freshman course taken is three or five hours a week.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 15). In junior and senior years any courses above 50 may be presented, except Course 54. Astronomy 101-102, Physics 121-122, and, with the consent of the major department, other courses open only to juniors and seniors may be presented.

*For a Teacher's Certificate,* an average of at least one and one-half honor points per credit hour through Course 51; Course 54; and an average of at least one honor point per credit hour in all other courses taken in the department. Course 6 must be included if not offered for admission.

### COURSES

| No. | Credit | Title | | Offered to | | Prereq. courses |
|---|---|---|---|---|---|---|
| 1a | 5 | Higher Algebra, Part I ..... | | Fr., soph. | | Elem. Algebra |
| | | 8 | TWThFS | 125F | ¶ | |
| | | 9 | TWThFS | 125F | ¶ | |
| | | 11 | TWThFS | 104F | ¶ | |
| | | 2 | MTWThF | 104F | ¶ | |
| 1b | 5 | Higher Algebra, Part I ..... | | Fr., soph. | | Elem. Algebra |
| | | 8 | TWThFS | 105F | ¶ | |
| 2a | 5 | Algebra and Plane Trigonometry. | | Fr., soph. | | 1 or prep. higher Alg. |
| | | 9 | TWThFS | 104F | ¶ | |
| | | 10 | TWThFS | 105F | ¶ | |
| 2b | 5 | Algebra and Plane Trigonometry. | | Fr., soph. | | 1 or prep. higher Alg. |
| | | 8 | TWThFS | 125F | ¶ | |
| | | 9 | TWThFS | 125F | ¶ | |
| | | 11 | TWThFS | 104F | ¶ | |
| | | 2 | MTWThF | 104F | ¶ | |

| | | | | |
|---|---|---|---|---|
| 127a or 127b | 3 | Infinite Series ..... | Sr., grad. | 17 cred. besides Alg. and Trig. |
| 140 | 2 | Method of Least Squares. | Sr., grad. | 51 |

54a,b. TEACHERS' COURSE. Text and assigned readings. Special attention paid to the fundamental principles of Algebra and Geometry. REEVE.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 95-98.

## MUSIC

Professor CARLYLE SCOTT; Assistant Professor DONALD FERGUSON; Special Instructors MAXIMILIAN DICK, THADDEUS GIDDINGS, GERTRUDE REEVES, CLARA WILLIAMS.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, not including Courses 11-12 and 21-22.

*A Major* is offered only to those who take the four-year course in Arts and Music.

For the curriculum of the four-year course in Arts and Music, leading to the degree of Bachelor of Arts in Music, see page 25 of the Science, Literature, and the Arts bulletin. The tabular statement and description of courses given below are for the guidance of other students in the College of Science, Literature, and the Arts who desire ot elect Music.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1-2 | 6 | Harmony ..... | | Jr., sr. | None |
| | | 10 | TThS | Mu | Scott |
| | | 11 | TThS | Mu | Scott |
| 3-4 | 4 | Counterpoint ..... | | Jr., sr. | Harmony |
| | | 11 | TTh | Mu | Ferguson |
| 5-6 | 4 | Composition ..... | | Jr., sr. | |
| | | Ar | Ar | Mu | Ferguson |
| 7-8 | 2 | Analysis ..... ... | | Jr., sr. | Harmony |
| | | 12 | W | Mu | Scott |
| 9-10 | 6 | History of Music ..... | | Jr., sr. | None |
| | | 9 | MWF | Mu | Ferguson |
| 11-12 | 1 | Appreciation of Music ..... | | Jr., sr. | None |
| | | 2 | M | Mu | Reeves |
| 13-14 | 4 | Bach-Beethoven ..... | | Jr., sr. | None |
| | | 1, 2 | T | Mu | Ferguson |
| 15-16 | 4or8 | Pianoforte ..... | | Jr., sr. | |
| 17-18 | | Ar | | Mu | Scott, Ferguson, Reeves |
| 19-20 | 4or8 | Violin ..... | | Jr., sr. | |
| | | Ar | Ar | Mu | Dick |
| 21-22 | 4 | Voice ..... | | Jr., sr. | |
| | | Ar | Ar | Mu | Williams |
| 27-28 | 6 | Public School Music ..... | | Jr., sr. | |
| | | 4, 5 | WF | Ed | Giddings |
| 29-30 | 4 | Normal Piano ..... | | Jr., sr. | |
| | | 3 | TF | Mu | Reeves |
| 31-32 | 2 | Ensemble ..... | | Jr., sr. | |
| | | 12 | F | Mu | Dick |

| | | | | | | |
|---|---|---|---|---|---|---|
| 33-34 | | Ear Training ..... | | | Jr., sr. | None |
| | | | 2 | Th | Mu | Reeves |
| 35-36 | 2 | Orchestra ..... | | | Soph., jr., sr. | |
| | | | 7:30 | M | ME | Ferguson |

27-28. PUBLIC SCHOOL MUSIC. Preparation for teachers and supervisors of music in public, high schools, and normal schools. Piano playing, singing, and ready reading prerequisite. Four hours in class and one half day weekly in public school visiting. Practice teaching demanded. GIDDINGS.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 99-101.

## PHILOSOPHY AND PSYCHOLOGY

Professors NORMAN WILDE, MELVIN E. HAGGERTY; Associate Professor DAVID F. SWENSON; Assistant Professors HERBERT WOODROW, JOSEPH PETERSON, RUPERT C. LODGE; Instructors HAROLD R. CROSLAND, JOHN F. DASHEILL, JACOB KANTOR.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits, either in Philosophy or in Psychology. The following courses are classified under Philosophy: 9, 13, 20, 51, 56, 63, 64, 109, 118, 121, 122, 123, 124, 126, 127, 129-130, 135. A major in Philosophy must include Courses 9, 121, and 122, as well as a minimum of three, or a maximum of six, credits in the psychological group. The following courses are classified under Psychology: 1-2, 5, 17, 18, 55, 56, 101, 105, 107, 108, 109, 115-116; a major in Psychology must include Courses 1-2 and 101, as well as a minimum of three, or a maximum of six, credits from the philosophical group.

*For B.A. with Honors,* besides the general requirements (page 15), a major in either Philosophy or Psychology, and twenty-four credits in starred courses.

### COURSES

*First Semester*

| No. | Credit | Title | | | Offered to | Prereq. courses |
|---|---|---|---|---|---|---|
| 1-2 | 6 | General Psychology ..... | | | Soph. jr., sr. | None |
| | | | 8 | MWF | 321F | Peterson |
| | | | 8 | TThS | 321F | Kantor |
| | | | 9 | MWF | 321F | Peterson |
| | | | 10 | MWF | 321F | Haggerty |
| | | | 10 | TThS | 321F | Dasheill |
| | | | 11 | MWF | 321F | Crosland |
| | | | 11 | TThS | 321F | Dasheill |
| | | | 2 | MWF | 321F | Peterson |
| | | | 2 | MWF | 321F | Dasheill |
| | | | 3 | MWF | 321F | Kantor |
| 5a | 3 | Elements of Psychology ..... | | | Soph. jr., sr. | None |
| | | | 9 | MWF | 322F | Swenson |
| | | | 2 | MWF | 322F | Lodge |

| | | | | | |
|---|---|---|---|---|---|
| 9a | 3 | Logic | | Soph. jr., sr. | None |
| | | 10 | TThS | | Lodge |
| | | 3 | MWF | 322F | Lodge |
| 13 | 3 | Introduction to Philosophy | | Soph., jr., sr. | 3 credits |
| | | See statement | | | |
| 17 | 3 | Methods of Study | | Soph., jr., sr. | Course 5 or 1-2 |
| | | See statement | | | |
| 51a | 3 | Ethics | | Jr., sr. | 6 credits |
| | | 10 | MWF | 322F | Wilde |
| | | 10 | TThS | 322F | Wilde |
| 55 | 3 | Abnormal Psychology | | Jr., sr. | 6 cred. inc. 5 or 1-2 |
| | | 8 | TThS | 321F | Crosland |
| 65 | 3 | Development of Religion | | Jr., sr. | 6 credits |
| | | 9 | TThS | 322F | Swenson |
| 101 | 3 | Exper. Psychology | | Jr., sr., grad. | 1-2 |
| | | 2, 3 | MW | 318F | Woodrow and Crosland |
| | | 2 3 | TTh | 318F | |
| 101a | 3 | Exper. Psychology Lect. | | Jr., sr., grad. | 1-2 |
| | | 4 | T | 322F | Woodrow |
| 105 | 3 | Mental Retardation | | Jr., sr., grad. | 1-2 |
| | | 4, 5 | Th | 316F | Woodrow |
| 107 | 3 | Social Psychology | | Jr., sr., grad. | 6 cred. inc. 5 or 1-2 |
| | | 9 | TThS | 311½F | Peterson |
| 109 | 3 | Psychological Principles | | Jr., sr., grad. | 12 cred. inc. Course 9 and 1-2 or 5 |
| | | 8 | MWF | 322F | Kantor |
| 115-116 | 6 | Seminar in Psychology | | Sr., grad. | 12 credits |
| | | Ar | Ar | 316F | Woodrow |
| 121 | 3 | Ancient Philosophy | | Jr., sr., grad. | 6 credits |
| | | 11 | TThS | 322F | Wilde |
| 123 | 3 | Scandinavian Philosophy | | Sr., grad. | 9 credits |
| | | Ar | Ar | 316F | Swenson |
| 129-130 | 6 | Seminar in Philosophy | | Sr., grad. | 12 credits |
| | | Ar | Ar | 316F | Wilde |
| 135 | 3 | Philosophy of Plato | | Sr., grad. | Course 121, 122, or 124 |
| | | 11 | MWF | 322F | Lodge |
| 127 | 3 | Metaphysics | | Sr., grad. | 12 credits |
| | | See statement | | | |

*Second Semester*

| | | | | | |
|---|---|---|---|---|---|
| 1-2 | 6 | General Psychology | | Soph., jr., sr. | None |
| | | 8 | MWF | 321F | Peterson |
| | | 8 | TThS | 321F | Kantor |
| | | 9 | MWF | 321F | Peterson |
| | | 10 | MWF | 321F | Haggerty |
| | | 10 | TThS | 321F | Dasheill |
| | | 11 | MWF | 321F | Crosland |
| | | 11 | TThS | 321F | Dasheill |
| | | 2 | MWF | 321F | Peterson |
| | | 2 | MWF | 321F | Dasheill |
| | | 3 | MWF | 321F | Kantor |
| 5b | 3 | Elements of Psychology | | Soph., jr., sr. | None |
| | | 10 | TThS | | Lodge |
| | | 3 | MWF | 322F | Lodge |
| 5b | 3 | Elem. of Psych. (music course) | | Soph., jr., sr. | None |
| | | 9 | TThS | 318F | Woodrow |
| 9b | 3 | Logic | | Soph., jr., sr. | None |
| | | 9 | MWF | 322F | Swenson |
| | | 2 | MWF | 322F | Lodge |

| | | | | | | |
|---|---|---|---|---|---|---|
| 18 | 3 | Child Development ..... | | Soph., jr., sr. | 5 or 1-2 | |
| | | 8 | MWF | 322F | Dasheill | |
| 20 | 3 | Present Day Philosophy ..... | | Jr., sr. | 6 credits | |
| | | 10 | MWF | 322F | Wilde | |
| 56 | 3 | Esthetics ..... | | Jr., sr. | 6 credits | |
| | | 8 | TThS | 322F | Swenson | |
| 66 | 3 | Philosophy of Religion ..... | | Jr., sr. | 6 credits | |
| | | 9 | TThS | 322F | Swenson | |
| 101b | 3 | Experimental Psychology .... | | Jr., sr., grad. | 1-2 | |
| | | 2, 3 | MW | 318F | Woodrow and Crosland | |
| | | 2, 3 | TTh | 318F | | |
| 101b | 3 | Experimental Psychology Lect. | | Jr., sr., grad. | 1-2 | |
| | | 4 | T | 322F | Woodrow | |
| 108 | 3 | Comparative Psychology ..... | | Jr., sr., grad. | 101 | |
| | | 9 | TThS | 311½F | Peterson | |
| 115-116 | 6 | Seminar in Psychology ..... | | Sr., grad. | 12 cred. in Psych. | |
| | | Ar | Ar | 316F | Woodrow | |
| 118 | 3 | Advanced Ethics ..... | | Jr., sr., grad. | 6 credits | |
| | | 10 | TThS | 322F | Wilde | |
| 122 | 3 | Modern Philosophy ..... | | Jr., sr., grad. | 6 credits | |
| | | 11 | TThS | 322F | Wilde | |
| 124 | 3 | 19th Century Philosophy .... | | Sr., grad. | 12 cred. in Phil. | |
| | | 11 | MWF | 322F | Lodge | |
| 126 | 3 | Logic of Science ..... | | Jr., sr., grad. | 9 cred. including 9 | |
| | | See statement | | | | |
| 129-130 | 6 | Seminar in Philosophy ..... | | Sr., grad. | 12 cred. in Phil. | |
| | | Ar | Ar | 316F | Wilde | |

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 101-105.

## PHYSICAL EDUCATION

### FOR MEN

Director LOUIS J. COOKE; Assistant Director WILLIAM K. FOSTER; Instructor JOHN C. WEST; Assistant BOTTOLF M. OHNSTAD.

### GENERAL STATEMENT

The purpose of the department is to provide all men of the University opportunity for exercise in order to maintain and build up their general health. It also provides special training for the correction of physical defects and functional derangements.

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. Students taking the required work in physical education are examined also at the close of the year. A study of these records shows a marked improvement in the standard of health of the average student during his college course.

The gymnasium, swimming pool, and baths are open to all students of the University, who are free to use the apparatus and to pursue a course in physical training under the supervision of the director and his assistants.

Those students, taking the required course in physical education who can not swim, must make a reasonable effort as determined by the department, to pass the swimming and life-saving requirements, and will be assigned special hours for instruction.

COURSES

| No. | Credits | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1 | None | Personal Hygiene ..... | | Fr. | None |
| | | 2 | MF | 201A | Cooke |
| | | 3 | MF | 201A | Cooke |
| | | 11 | TS | 201A | Cooke |
| | | 11 | WF | 201A | Cooke |
| 3-4 | None | Gymnasium ..... | | Fr. | None |
| | | 2 | MF | 100A | Foster-West |
| | | 3 | MF | 100A | Foster-West |
| | | 11 | TS | 100A | Foster-West |
| | | 11 | WF | 100A | Foster-West |
| 5-6 | | Intermediate Gymnastics ... | | Fr. | None |
| | | 2 | MF | 100A | Foster-West |
| | | 3 | MF | 100A | Foster-West |
| | | 11 | TS | 100A | Foster-West |
| | | 11 | WF | 100A | Foster-West |
| 7-8 | 2† | Advanced Leaders ..... | | Soph., jr., sr. | 1, 3-4, 5-6 |
| | | 2 | MF | 100A | Foster-West |
| | | 3 | MF | 100A | Foster-West |
| | | 11 | TS | 100A | Foster-West |
| | | 11 | WF | 100A | Foster-West |
| 9-10 | None | Corrective Gymnastics ..... | | All | None |
| | | Ar | Ar | 100A | Ohnstad |
| 11-12 | None | Wrestling ..... | | Soph., jr., sr. | None |
| | | 5 | MWF | 106A | Foster-Ohnstad |
| 13-14 | None | Advanced Gymnastics ..... | | Soph., jr., sr. | None |
| | | Ar | Ar | Ar | West-Foster |
| 15-16 | None | Intermediate Swimming .... | | All | None |
| | | Ar | Ar | | Ohnstad |
| 17-18 | None | Advanced Swimming ..... | | All | 15-16 |
| | | Ar | Ar | | Foster-Ohnstad |

† Both semesters must be completed before credit is given for the first semester.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 105-107.

## PHYSICAL EDUCATION

### FOR WOMEN

Assistant Professor J. ANNA NORRIS; Instructors MAY S. KISSOCK, VALERIA G. LADD, ALICE HOPKINS TOLG.

### INTRODUCTORY STATEMENT

This department aims to promote the health 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 year in college; conducts yearly consultations with, and examines when necessary, all upper class students; gives courses in hygiene; organizes physical

work to meet the varying needs and physical tastes of students; coöperates closely with the Woman'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; and investigates cases of illness which come to its attention.

Work in this department is required of all newly entering students (see Courses 1-2 and 11), and of all students permitted, for reasons connected with their physical condition, to carry less than the minimum number of credit hours. Physical examinations or consultations required annually of all students.

Elective work without credit arranged in social dancing, gymnastic dancing, swimming, fencing, basket ball, baseball, and other activities.

A professional course, 15-16, for those who desire to teach, will be offered for the first time in 1916-17. All senior students who desire a recommendation for teaching must also take Course 5-6 in 1916-17 whether or not it has been previously taken.

COURSES

| No. | *Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1-2 | None | Elem. Physical Training ... | | Required of all new students | None |
| | | 11 | MWF | 3, 151, 153WGm | |
| | | 11 | TThS | 3, 151, 153WGm | |
| | | 3 | MWF | 3, 151, 153WGm | |
| | | 4 | MWF | 3, 151, 153WGm | |
| 3-4 | 3 | Intermediate Phys. Training | | Soph., jr., sr. | Equivalent of 1-2 |
| | | 3 | TTh | 153WGm | Kissock |
| | | (One other hour to be arranged) | | | |
| 5-6 | 3 | Advanced Phys. Training.. | | Jr., sr. | 3-4 |
| | | 4 | TTh | 153WGm | Ladd |
| | | (One other hour to be arranged) | | | |
| 11 | None | Preliminary Hygiene ..... | | Required of all new students | None |
| | | 12 | M | 201WGm | |
| | | 2 | T | 201WGm | |
| | | 11 | W | 201WGm | |
| | | 8 | S | 201WGm | |
| 13 | 3 | Personal Hygiene ..... | | Soph., jr., sr. | An. Biol. 1-2 |
| | | 9 | TThS | 201WGm | Norris |
| 14 | 3 | Hygiene of the Family.... | | Jr., sr. | 13 |
| | | 9 | TThS | 201WGm | Norris |
| 15-16 | 6 | Principles of Phys. Educ... | | Jr., sr. | 1-2, 3-4, 21-22, 31-32 |
| | | Lect. 10 | TThS | 201WGm | Kissock, Ladd, Tolg |
| | | Lab. 2 | MWF | 3, 151, 153WGm | Kissock, Ladd, Tolg |
| 21-22 | None | Elem. Esthetic Dancing .... | | All | None |
| | | 2 | TTh | 153WGm | Ladd |
| 23-24 | None | Intermed. Esthetic Dancing. | | All | Equivalent of 21-22 |
| | | 4:30 | M | 153WGm | Ladd |
| 25-26 | None | Adv. Esthetic Dancing .... | | Soph., jr., sr. | 23-24 |
| | | 4:30 | W | 153WGm | Ladd |

* Six credits the maximum number that can be gained by taking courses in exercise (Courses 3-4; 5-6); only one of these courses may be taken for credit in a semester.

| | | | | | |
|---|---|---|---|---|---|
| 31-32 | None | Folk Dancing and Organized Games ..... | | All | None |
| | | 10 | MW | 151WGm | Kissock |
| | | 3 | TTh | 151WGm | Ladd |
| 33-34 | None | Hockey, Basketball, Baseball | | All | Permission of director |
| | | 4:30 | MW | 151WGm | Kissock |
| | | 4:30 | WF | 151WGm | Kissock |
| | | 4:30 | MF | 151WGm | Kissock |
| 41-42 | None | Fencing Hour ..... | | All | None |
| | | 2 | F | 153WGm | Kissock |
| 43-44 | None | Elementary Swimming ..... | | Required of soph. who need instruction in swimming | None |
| | | 3 | M | 51WGm | Hansen |
| | | 4 | M | 51WGm | Hansen |
| | | 3 | T | 51WGm | Hansen |
| | | 4 | T | 51WGm | Hansen |
| | | 3 | Th | 51WGm | Hansen |
| | | 4 | Th | 51WGm | Hansen |
| | | 3 | F | 51WGm | Hansen |
| | | 4 | F | 51WGm | Hansen |

Students who know how to swim are admitted to the natatorium at 12 TTh, at 4:30 MWF, and at 5:00 TTh. All students are admitted to roller skating at one o'clock MWF. Special corrective exercise may be arranged for at 1:00 TTh.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 107-110.

## PHYSICS

Professors HENRY A. ERIKSON, ANTHONY ZELENY; Associate Professor LOUIS W. MCKEEHAN; Instructors ARTHUR H. COMPTON, ERNEST O. DIETERICH, PAUL D. FOOTE, PAUL E. KLOPSTEG, JOHN T. TATE.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 15); work chosen from any courses above 40, except 90; and any course in mathematics open only to juniors and seniors if approved by the department. Mathematics 106, 107, 108, 140 have already been thus approved. Thesis in connection with any course in Physics above 150.

*For a Teacher's Certificate,* fourteen credits, including Courses 90.

Courses 21, 22, 31, 42, 44, 161, 52, 54, with prerequisites in mathematics comprise a three-year course in Physics beginning with the freshman year. It is designed to meet the needs of those who intend to take up the teaching of Physics or who are planning to enter the field of industrial research. It is recommended to those students desiring honors in Physics. Students who have completed Courses 1, 2, 3, 4, or Courses 7, 8, 9, 10, may continue with the second year of this course after conference with the department.

## COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1 | 3 | General Physics ..... | | Soph., jr., sr. | Math. 2 or 4 |
| | | 1 | M | 30Ph | Zeleny |
| | | 8 | TTh | 16Ph | Klopsteg |
| | | 9 | TTh | 17Ph | Dieterich |
| | | 10 | TTh | 16Ph | Klopsteg |
| | | 11 | TTh | 16Ph | Klopsteg |
| | | 11 | WF | 16Ph | Klopsteg |
| 2 | 3 | General Physics ..... | | Soph., jr., sr. | 1 or 7 |
| | | 1 | M | 30Ph | Zeleny |
| | | 8 | TTh | 16Ph | Klopsteg |
| | | 9 | TTh | 17Ph | Dieterich |
| | | 10 | TTh | 16Ph | Klopsteg |
| | | 11 | TTh | 16Ph | Klopsteg |
| | | 11 | WF | 16Ph | Klopsteg |
| 3 | 1 | General Laboratory Practice.... | | Soph., jr., sr. | Registration in 1 |
| | | Ar | Ar | 23Ph | Ar |
| 4 | 1 | General Laboratory Practice.... | | Soph., jr., sr. | See statement |
| | | Ar | Ar | 23Ph | |
| 7 | 4 | General Physics ..... | | Soph., jr., sr. | Math. 2 or 4, see statement |
| | | 1 | F | 30Ph | Erikson |
| | | 8 | MWF | 17Ph | Tate |
| 8 | 4 | General Physics ..... | | Soph., jr., sr. | 7, See statement |
| | | 1 | F | 30Ph | |
| | | 8 | MWF | 17Ph | |
| 9 | 1 | General Laboratory Practice.... | | Soph., jr., sr. | See statement |
| | | 2-3 | F | 23Ph | ..... |
| 10 | 1 | General Laboratory Practice.... | | Soph., jr., sr. | See statement |
| | | 2-3 | F | 23Ph | ..... |
| 21 | 3 | Elements of Mechanics ..... | | Fr., soph. | High school Physics |
| | | Lect. 10 | ThS | 16Ph | Erikson |
| | | Lab. Ar | Ar | 31Ph | Erikson |
| 22 | 3 | Elements of Mechanics ..... | | Fr., soph. | 21, Math. 2 and reg. in Math. or 9b |
| | | Lect. 10 | ThS | 17Ph | Erikson |
| | | Lab. Ar | Ar | 31Ph | Erikson |
| 31 | 3 | Acoustics ..... | | Soph., jr., sr. | See statement |
| | | 9 | TThS | 16Ph | Erikson |
| 42 | 3 | Heat ..... | | Soph., jr., sr. | 2, 8, or 22, Math. 2 or 4 |
| | | 10 | TThS | ArPh | Foote |
| 44 | 1 | Experiments in Heat..... | | Soph., jr., sr. | Regis. in 42 |
| | | Ar | Ar | Ar | Foote |
| 52 | 3 | Light ..... | | Soph., jr., sr. | 2, 8 or 22, Math. 2 or 4 |
| | | 9 | TThS | 16Ph | Erikson |
| 54 | 1 | Experiments in Light..... | | Soph., jr., sr. | Regis. in 52 |
| | | Ar | Ar | ArPh | Erikson |
| 81 | 2 | Physical Manipulation and Laboratory Technique ..... | | Soph., jr., sr. | 2 and 4, 8 and 10, or 22 |
| | | 2, 3, 4 | TTh | 2Ph | McKeehan |
| 82 | 2 | Physical Instruments of Precision ..... | | Soph., jr., sr. | 81 |
| | | 2, 3, 4 | TTh | 2Ph | McKeehan |

| | | | | | | |
|---|---|---|---|---|---|---|
| 90 | 1 | Teachers' Course ..... | | Sr. | | 2 and 4, 8 and 10, or 2 yrs. of Physics |
| | | | Ar | Ar | Ar | Zeleny |
| 121-122 | 6 | Dynamics ..... | | Jr., sr., grad. | | 2 or 8 or 22 and Math. 51 |
| | | | 9 | MWF | 17Ph | Tate |
| 125-126 | 6 | Chemical Dynamics ..... | | Jr., sr. | | 8 and 10 or 22, Math. 51, Chem. 1-2 or 3-4 |
| | | | 8 | TThS | 17Ph | McKeehan |
| 155 | 3 | Spectrometry ..... | | Jr., sr., grad. | | 52 and 82 |
| | | | 1, 2, 3 | MW | 4Ph | Erikson |
| 161 | 4 | Electricity and Magnetism ..... | | Jr., sr., grad. | | 2 & 4, 8 & 10 or 22 |
| | | | Ar | Ar | ArPh | Zeleny |
| 162a | 2 | Electrical Measurements ..... | | Jr., sr., grad. | | 161 |
| | | | 3, 4 | M | 31Ph | Zeleny |
| | | | 10, 11 | TTh | 31Ph | Zeleny |
| 162b | 3 | Electrical Measurements ..... | | Jr., sr., grad. | | 161 |
| | | | Ar | Ar | Ar | Zeleny |
| 166 | 3 | Electrical Meas. of Precision... | | Jr., sr., grad. | | 162 |
| | | | 3, 4, 5 | MF | 31Ph | Zeleny |
| 174 | 3 | Radioactivity and Roentgen Rays | | Sr., grad. | | 2 and 4 |
| | | | Ar | Ar | Ar | |
| 177 | 3 | Radioactivity ..... | | Sr., grad. | | 8 cred. in Physics and Math. 11 |
| | | | 4 | MWF | 15Ph | McKeehan |
| 178 | 3 | Radioactivity Measurements .... | | Sr., grad. | | 177 |
| | | | 1, 2, 3 | MW | 15Ph | McKeehan |
| 181 | 3 | Adv. Physical Measurements ... | | Sr., grad. | | 82 |
| | | | 2, 3, 4 | MW | 2Ph | McKeehan |
| 182 | 3 | Adv. Physical Measurements .. | | Sr., grad. | | 181 |
| | | | 2, 3, 4 | MW | 2Ph | McKeehan |
| 191a | 3 | Elem. Physical Investigation ... | | Sr., grad. | | 82 |
| | | | 2, 3, 4 | MW | 2Ph | McKeehan |
| 192a | 3 | Elem. Physical Investigation ... | | Sr., grad. | | 82 |
| | | | 2, 3 | MWF | 15Ph | Erikson |
| 191b | 3 | Elem. Physical Investigation ... | | Sr., grad. | | 191 |
| | | | 2, 3 | MWF | 15Ph | Erikson |
| 192b | 3 | Elem. Physical Investigation ... | | Sr., grad. | | 191 |
| | | | 2, 3, 4 | MW | 2Ph | McKeehan |

90. TEACHERS' COURSE. Methods of presentation; selection of lecture and laboratory experiments; laboratory management. ZELENY.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 110-114.

## POLITICAL SCIENCE

Professors WILLIAM A. SCHAPER, CEPHAS D. ALLIN, JEREMIAH S. YOUNG; Instructors WILLIAM ANDERSON, BEN A. ARNESON; Assistant PERCIVAL W. VIESSELMAN.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* see general requirements (see page 15).

*For Teacher's Certificate in Government,* nine credits in Political Science and eighteen credits in History.

The Departments of Economics, Political Science, History, and Sociology and Anthropology constitute a social science group. The subjects are intimately inter-related, and they are all of especial importance to students who intend to engage in law, business, public service at home or abroad, journalism, the work of charities and corrections, or to give instruction in one of the social sciences. Students who are interested in the work of any one of the departments of the social science group ought to be familiar with at least the elements of the subjects offered in the other departments. A student who takes his major in any one of them ought to have more than the elements of the others.

## COURSES

### *Introductory Courses*

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1a | 3 | American Government ..... | | Soph., jr., sr. | None |
| | | 9 | MWF | 109MA | Allin |
| | | 9 | TThS | 102MA | Schaper |
| | | 10 | MWF | 209MA | Anderson |
| | | 10 | TThS | Ar. | Viesselman |
| | | 11 | TThS | 202MA | Allin |
| | | 2 | MWF | 109MA | Anderson |
| 1b | 3 | American Government ..... | | Soph., jr., sr. | None |
| | | 9 | TThS | 109MA | Anderson |
| | | 10 | MWF | 202MA | Allin |
| | | 2 | MWF | 209MA | Anderson |

### *General Courses*

| | | | | | |
|---|---|---|---|---|---|
| 3 | 3 | Comparative Government ..... | | Soph., jr., sr. | 1 |
| | | 10 | TThS | 102MA | Allin |
| 5 | 3 | European Municipal Admin. .. | | Soph., jr., sr. | 1 |
| | | 11 | MWF | 102MA | Schaper |
| 6 | 3 | American Municipal Admin. .. | | Soph., jr., sr. | 1 |
| | | 11 | MWF | 109MA | Schaper |
| 7a | 3 | State and Local Government... | | Soph., jr., sr. | 1 |
| | | 9 | TThS | 109MA | Anderson |
| | | 2 | MWF | 209MA | Viesselman |
| 7b | 3 | State and Local Government... | | Soph., jr., sr. | 1 |
| | | 10 | MWF | 109MA | Anderson |
| | | 11 | TThS | 202MA | Viesselman |
| 9 | 3 | Colonial Administration ..... | | Soph., jr., sr. | 1 |
| | | See statement | | | |
| *51 | 3 | Business Law, I ..... | | Jr., sr. | 6 cred. in Pol. Sci., or 6 in Econ., or 3 in each |
| | | 9 | MWF | 202MA | Viesselman |
| *52 | 3 | Business Law, II ..... | | Jr., sr. | 51 |
| | | 9 | MWF | 202MA | Viesselman |
| *54 | 3 | Latin American Relations..... | | Jr., sr. | 6 credits |
| | | 9 | MWF | 213MA | Schaper |
| *58 | 3 | American Diplomatic Problems. | | Jr., sr. | 6 credits |
| | | 11 | TThS | 213MA | Anderson |
| *59 | 3 | Municipal Corporations ..... | | Jr., sr. | 6 credits |
| | | 11 | TThS | 102MA | Anderson |

*Special Courses*

| | | | | | |
|---|---|---|---|---|---|
| 25 | 3 | American Govt. (Engineers) .. | | Jr., sr. | None |
| | | 8 | TThS | 136ME | Viesselman |
| 26 | 3 | Commercial Law (Engineers).. | | Jr., sr. | 25 |
| | | 8 | TThS | 136ME | Viesselman |
| *56-57 | 3 | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 4 | MW | Lib | Schaper |

*Advanced Courses*

| | | | | | |
|---|---|---|---|---|---|
| *101 | 3 | Constitutional Law ..... | | Jr., sr., grad. | 6 credits |
| | | 9 | MWF | 213MA | Schaper |
| *102 | 3 | Modern Political Thought ..... | | Jr., sr., grad. | 6 credits |
| | | 9 | TThS | 102MA | Schaper |
| *104 | 3 | Political Parties ..... | | Jr., sr., grad. | 6 cred. or 1 & Hist. 5-6 |
| | | See statement | | | |
| *105 | 3 | Comparative Administration ... | | Jr., sr., grad. | 6 credits |
| | | 10 | MWF | 109MA | Arneson |
| *106 | 3 | Legislative Power and Methods. | | Jr., sr., grad. | 6 credits |
| | | 10 | MWF | 102MA | Arneson |
| *108 | 3 | Police Power ..... | | Jr., sr. | 6 credits |
| | | See statement | | 102MA | Viesselman |
| *109 | 3 | Diplomacy ..... | | Jr., sr., grad. | 6 cred. or 1 and History 156 |
| | | 2 | MWF | 213MA | Allin |
| *110 | 3 | International Law ..... | | Jr., sr., grad. | 1 and 3 or 109 |
| | | 2 | MWF | 102MA | Allin |
| *112 | 3 | Comparative Federal Govt. .... | | Jr., sr., grad. | 6 credits |
| | | 11 | TThS | 102MA | Allin |
| *114 | 3 | Govt. of the British Empire... | | Jr., sr., grad. | 6 cred. or 1 & Hist. 7 |
| | | 10 | TThS | 102MA | Allin |

56-57. TEACHERS' COURSE. Lectures on teaching Government in the secondary schools, given in coöperation with the Department of History and credited as part of History 56-57. SCHAPER.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 114-118.

## RHETORIC AND PUBLIC SPEAKING

Professor JOSEPH M. THOMAS, MARGARET SWEENEY; Assistant Professors *DANIEL FORD, HALDOR GISLASON, CHARLES W. NICHOLS, SIDNEY F. PATTISON, ANNA H. PHELAN, FRANK M. RARIG, CHARLES E. SKINNER, HELEN A. WHITNEY; Instructors CECIL C. BEAN, ELBRIDGE COLBY, ELIZABETH HAWTHORN, GEORGE E. HEDGER, CYRIL A. HERRICK, JAMES T. HILLHOUSE, ELIZABETH JACKSON, MARTIN B. RUUD, SANFORD M. SALYER, FRANK SMOYER, ARTHUR J. TIEJE, HOWARD T. VIETS; Assistant RAY M. WILCOX.

### REQUIREMENTS OF THE DEPARTMENT

*For a Major,* twenty-four credits, which may include not more than six credits in Public Speaking.

*For a Minor,* twelve credits in addition to Course 1-2, including Courses 11-12 or 15-16.

* Absent on leave, 1916-17.

*For a Minor in Public Speaking,* twelve credits in Public Speaking.

*For B.A. with Honors,* the general requirements (page 15). A reading knowledge of either Latin, French, or German. At least fifteen credits in departmental starred courses, four of these credits to be in Course 119-120.

*For a Teacher's Certificate in English*

A. English as the major subject of teaching; Rhetoric 1-2, either 11-12 or 15-16, and 41-42; English 1-2, and six additional hours, three of which are to be in courses numbered above 100.

B. English as a minor subject of teaching; Rhetoric 1-2, either 11-12 or 15-16; English 1-2, and at least three additional hours.

To be recommended, a student must secure an average of at least one and one-half honor points for each credit hour of all the work taken in the Department of English and Rhetoric.

*For a Teacher's Certificate in Public Speaking.* A student actively interested in some phase of Public Speaking either as a member of a literary or debating society, or as a participant in a contest or dramatic performance, or as a lecturer; must have the approval of the Department of Rhetoric and Public Speaking; and must complete the following courses: Rhetoric 1-2, 11-12 or 15-16, 41-42, and six additional hours in Public Speaking.

COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1-2 | 6 | Composition and Rhetoric ... | | Fr. | None |
| | | 8 | MWF | Room to be assigned on registration | |
| | | 9 | MWF | | |
| | | 10 | MWF | | |
| | | 11 | MWF | | |
| | | 2 | MWF | | |
| | | 3 | MWF | | |
| | | 4 | MWF | | |
| | | 8 | TThS | | |
| | | 9 | TThS | | |
| | | 10 | TThS | | |
| | | 11 | TThS | | |
| 1b | 3 | Composition and Rhetoric... | | Fr. | None |
| | | 11 | MWF | 304F | |
| | | 3 | MWF | 303F | |
| | | 11 | TThS | 311F | |
| 2a | 3 | Composition and Rhetoric.... | | Fr. | None |
| | | 11 | MWF | 304F | |
| | | 3 | MWF | 303F | |
| 3-4 | 6 | Composition for Engineers.. | | Fr., eng. | None |
| | | See program for the College of Engineering | | | |
| 11-12 | 6 | Exposition, Description, Narration ..... | | Soph., jr., sr. | 1-2 |
| | | 9 | MWF | 304F | Hillhouse |
| | | 11 | MWF | 306F | Gilbreath |
| | | 2 | MWF | 304F | |
| | | 9 | TThS | 311F | Ruud |
| | | 10 | TThS | 306F | Phelan |

| | | | | | |
|---|---|---|---|---|---|
| 15-16 | 6 | Exposition and Argument... | | Soph., jr., sr. | 1-2 |
| | | 10 | MWF | 303F | Salyer |
| | | 11 | TThS | 303F | Tieje |
| 31 | 2 | Technical Writing ..... | | Sr., eng. | 3-4 |
| | | See program of the College of Engineering | | | |
| 41-42 | 6 | Public Speaking ..... | | Soph., jr., sr. | 1-2 |
| | | 8 | MWF | 308F | Gislason |
| | | 2 | MWF | 308F | Wilcox |
| | | 8 | TThS | 308F | Wilcox |
| | | 9 | TThS | 308F | Gislason |
| | | 10 | TThS | 308F | Rarig |
| | | 11 | TThS | 308F | Wilcox |
| 41 | 3 | 9 | MWF | 308F | Rarig |
| 45-46 | 6 | Argumentation and Debate.. | | Soph., jr., sr. | See statement |
| | | 10 | MWF | 308F | Gislason |
| 47 | 3 | Advanced Debate ..... | | | See statement |
| | | Ar | Ar | 308F | Gislason, Rarig |
| †80a | 3 | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 3-430 | WF | 113Ed | Inglis |
| †80b | 3 | Teachers' Course ..... | | Jr., sr. | See statement |
| | | 3-430 | WF | 113Ed | Inglis |
| †81-82 | 6 | Interpretative Reading ..... | | Jr., sr. | 1-2, 41-42 |
| | | 11 | MWF | 308F | Rarig |
| *83-84 | 6 | Advanced Public Speaking... | | Jr., sr. | 1-2, 41-42 |
| | | 3 | MWF | 308F | Rarig |
| *102 | 3 | Versification ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 10 | TThS | 302F | Nichols |
| *103-104 | 6 | Studies in Structure and Style ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 2 | MWF | 311½F | Whitney |
| *107 | 3 | Imitative Writing ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 11 | MWF | 311F | Thomas |
| *110 | 3 | Short-story Writing ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 11 | MWF | 311F | Thomas |
| *111-112 | 6 | Essay Writing ..... | | Jr., sr., grad. | 1-2, 11-12 or 15-16 |
| | | 11 | TThS | 302F | Pattison |
| *115-116 | 6 | Dramatic Technique ..... | | Sr., grad. | See statement |
| | | 1-3 | W | 302F | Skinner |
| | | 2 | F | | |
| *119-120 | 4 | Seminar in Writing ..... | | Sr., grad. | See statement |
| | | 2-4 | T | 302F | Thomas |
| *201-202 | 6 | Seminar in Rhetoric..... | | Sr., grad. | See statement |
| | | 2-4 | Th | 302F | Sweeney |

† Carries credit only in the Department of Education.

80a,b. TEACHERS' COURSE. Methods of teaching English in high schools. Course of study, textbooks, and equipment; visits to Minneapolis and St. Paul high schools; theme-correcting. Open to juniors, seniors, and graduates, qualifying for *practice teaching*. Credit only in Education. INGLIS.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 118-122.

## ROMANCE LANGUAGES

Professors EVERETT W. OLMSTED, COLBERT SEARLES; Assistant Professors JULES FRELIN, RUTH S. PHELPS; Professorial Lecturers PAUL D'EQUILLY MORIN, PEDRO HENRÍQUEZ UREÑA; Instructors HARRY E.

ATWOOD, FRANCIS B. BARTON, NELSON F. COBURN, MARCEL MORAUD, WILLIS J. PLUMMER, EDWARD H. SIRICH; Teaching Fellows GEORGE S. BARNUM, ELLSWORTH CARLSON.

## REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits not including Course 1.

*For a Major,* twenty-four credits.

*For a B.A. with Honors,* general requirements (page 15); a reading knowledge of Latin or German and two years work in Spanish or Italian. In the junior year, Courses 65-66, 101-102, 61-62, 63-64; in the senior year Courses 103-104, 107-108, 109-110, 113-114. Substitutions for these courses may be granted by the department in special cases. Alternation of courses required in the junior and senior years is allowable.

*For Major Recommendation for Teacher's Certificate.* In addition to Course 1a and 3a, twenty-six credits.

*For Minor Recommendation for Teacher's Certificate.* In addition to Course 1a and 3a, twelve credits.

Prerequisites for Teacher's Course: In addition to Course 5-6, one Conversation-Composition Course and one Literary Course.

## COURSES

| No. | Credit | Title | | Offered to | | Prereq. courses |
|---|---|---|---|---|---|---|
| 1a | 6 | Beginning French ..... | | All | | None |
| | | 8 | MTWThFS | 201F | ¶ | |
| | | 9 | MTWThFS | 201F | ¶ | |
| | | 10 | MTWThFS | 227F | ¶ | |
| | | 11 | MTWThFS | 226F | ¶ | |
| 1b | 6 | Beginning French ..... | | All | | None |
| | | 10 | MTWThFS | 205F | ¶ | |
| | | 11 | MTWThFS | 227F | ¶ | |
| 2a | 3 | Beginning French (second half of 1a) ..... | | All | | 1 year high school French |
| | | 9 | MWF | 227F | ¶ | |
| 3a | 6 | Intermediate French ..... | | All | | 1a or equivalent |
| | | 10 | MTWThFS | 205F | ¶ | |
| | | 11 | MTWThFS | 25F | ¶ | |
| 3b | 6 | Intermediate French ..... | | All | | 1a or equivalent |
| | | 8 | MTWThFS | 201F | ¶ | |
| | | 9 | MTWThFS | 201F | ¶ | |
| | | 10 | MTWThFS | 227F | ¶ | |
| | | 11 | MTWThFS | 226F | ¶ | |
| 4 | 6 | Survey French Literature .... | | All | | 3a or equivalent |
| | | 9 | MTWThFS | 227F | Barton | |
| 5-6 | 6 | Surv. French Lit. (yr. course) | | All | | 3a or equivalent |
| | | 9 | TThS | 202F | | |
| | | 10 | TThS | 202F | Phelps | |
| | | 11 | TThS | 5F | Atwood | |
| | | 2 | MWF | 15F | Sirich | |
| 7-8 | 2 | Element. French Convers..... | | All | | 3a or equivalent |
| | | 9 | MW | 202F | | |
| | | 9 | TTh | 5F | Barton | |
| | | 3 | MW | 227F | Frelin | |

| | | | | | |
|---|---|---|---|---|---|
| 9-10 | 2 | Elementary French Compos... | | All | 3a or equivalent |
| | | 9 | F | 202F | |
| | | 9 | S | 5F | Barton |
| | | 3 | F | 227F | Frelin |
| 31a | 6 | Beginning Spanish ..... | | All | None |
| | | 10 | MTWThFS | 109F | Henríquez |
| | | 9 | MTWThFS | 301F | Plummer |
| 31b | 6 | Beginning Spanish ..... | | All | None |
| | | 9 | MTWThFS | 226F | Frelin |
| 33-34 | 6 | Begin. Spanish (yr. course).. | | All | None |
| | | 8 | TThS | 202F | Coburn |
| | | 11 | MWF | 201F | Olmsted |
| | | 11 | TThS | 205F | Plummer |
| 35a | 6 | Intermediate Spanish ..... | | All | 31a or equivalent |
| | | See statement | | | |
| 35b | 6 | Intermediate Spanish ..... | | All | 31a or equivalent |
| | | 10 | MTWThFS | 226F | Henríquez |
| | | 9 | MTWThFS | 15F | Plummer |
| 37-38 | 6 | Intermed. Spanish (yr. course) | | All | 31a or equivalent |
| | | 9 | MWF | 110F | Coburn |
| | | 11 | TThS | 110F | Henríquez |
| 39-40 | 6 | Spanish Lit. of 19th Century | | All | 35a or equivalent |
| | | 9 | MWF | 5F | Henríquez |
| 41-42 | 2 | Elem. Spanish Conversation.. | | All | 35a or equivalent |
| | | 2 | MW | 226F | Plummer |
| 43-44 | 2 | Elem. Spanish Composition .. | | All | 35a or equivalent |
| | | 2 | F | 226F | Plummer |
| 51-52 | 6 | Beginning Italian ..... | | All | None |
| | | 3 | MWF | 201F | Phelps |
| 53-54 | 6 | Repres. Italian Authors ..... | | Soph., jr., sr. | 51-52 or equivalent |
| | | 11 | TThS | 201F | Phelps |
| 61-62 | 2 | Adv. French Conversation ... | | Jr., sr. | 7-8 or equivalent |
| | | 11 | TTh | 202F | Morin |
| 63-64 | 2 | Adv. French Composition .... | | Jr., sr. | 9-10 or equivalent |
| | | 11 | S | 202F | Morin |
| 75-76 | 6 | French Lit. of 19th Century.. | | Soph., jr., sr. | 5-6 or equivalent |
| | | 11 | TThS | 15F | Barton |
| 101-102 | 6 | French Lit. of 18th Century. | | Jr., sr., grad. | 5-6 or equivalent |
| | | 11 | MWF | 15F | Sirich |
| 103-104 | 6 | French Lit. of 17th Century. | | Jr., sr., grad. | 5-6 or equivalent |
| | | 10 | MWF | 201F | Olmsted |
| 105-106 | 6 | French Lit. of 16th Century. | | Jr., sr., grad. | 101-102; 103-104; or equivalent |
| | | 11 | MWF | Seminar | Searles |
| 107-108 | 4 | French Oral Diction ..... | | Jr., sr., grad. | 61-62 or equivalent |
| | | 10 | MW | 202F | Morin |
| 109-110 | 2 | French Syntax ..... | | Jr., sr., grad. | 63-64 or equivalent |
| | | 10 | F | 202F | Morin |
| 111-112 | 4 | Lectures in French ..... | | Jr., sr., grad. | 5-6; 61-62 or equiv. |
| | | 2 | MW | 202F | Morin |
| 113-114 | 4 | French Lit. Classicism ..... | | | |
| | | See statement | | | |
| 115-116 | 4 | French Lyric Poetry ..... | | Sr., grad. | 103-104 or equiv. |
| | | 11 | TTh | Seminar | Searles |
| 117-118 | 4 | French Dramatic Lit. ..... | | Sr., grad. | 103-104 or equiv. |
| | | 10 | TTh | Seminar | Olmsted |
| 131-132 | 4 | Adv. Spanish Composition ... | | Jr., sr., grad. | 41-42 or equivalent |
| | | 2 | MW | 227F | Henríquez |

| | | | | | |
|---|---|---|---|---|---|
| 133-134 | 4 | Spanish Lectures ..... | | Jr., sr., grad. | 43-44 or equivalent |
| | | 2 | F | 227F | Henríquez |
| 135-136 | 2 | Spanish Novel (Not given 1916-1917) | | | |
| 151-152 | 4 | Dante, Petrarch, Boccaccio.... | | Jr., sr., grad. | 51-52 or equivalent |
| | | 11 | MW | 202F | Phelps |
| 153-154 | 2 | Dante, Petrarch, Boccaccio (in English) ..... | | Jr., sr., grad. | 51-52 or equivalent |
| | | 11 | F | 202F | Phelps |
| 161-162 | 2 | Teachers' Course ..... | | Jr., sr., grad. | See above |
| | | 2 | Th | 201F | Olmsted, et al. |

NOTE: Course 7-8 may be taken only with 9-10. 9-10 may be taken separately. Course 41-42 may be taken only with 43-44. 43-44 may be taken separately. Course 61-62 may be taken only with 63-64. 63-64 may be taken separately. Course 151-152 may be taken only with 153-154. 153-154 may be taken separately. Courses 1a, 3a, 31a, 35a, 4 are double courses. Students are advised to take Course 75-76 as a natural preparation for Course 101-102 and 103-104. Permission to register for courses from 75-76 to 161-162 inclusive may be granted by the department in special cases. Both semesters of any year course must be completed before credit is allowed for the first semester. The preceding statement applies also to Courses 1a and 3a for freshman and Courses 31a and 35a for freshman.

161-162. TEACHERS' COURSE. Lectures and discussions on methods, textbooks, etc. OLMSTED, et al.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 122-127.

## SCANDINAVIAN

Professors GISLE BOTHNE, ANDREW A. STOMBERG.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits, not including Courses 1 and 5.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* the general requirements (page 15), and six credits of Scandinavian in addition to what is required for a major.

### COURSES

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1 | 6* | Beginning Norwegian ..... | | All | None |
| | | 8 | MTWThFS | 206F | ¶ |
| 2 | 6 | Intermediate Norwegian .... | | All | 1 |
| | | 8 | MTWThFS | 206F | ¶ |
| 3-4 | 6† | Advanced Norwegian ..... | | Soph., jr., sr. | 2 |
| | | 9 | TThS | 206F | Bothne |
| 5 | 6* | Beginning Swedish ..... | | All | None |
| | | 8 | MTWThFS | F | Stomberg |
| 6 | 6 | Intermediate Swedish ..... | | All | 5 |
| | | 8 | MTWThFS | F | Stomberg |
| 7-8 | 6† | Advanced Swedish ..... | | Soph., jr., sr. | 6 |
| | | 9 | MWF | 206F | Stomberg |
| 9 | 2 | Beginning Norwegian ..... | | See statement | None |
| 10 | 2 | Advanced Norwegian ..... | | See statement | 9 |
| 11-12 | 4 | Norwegian Literature ..... | | See statement | 10 |
| | | 4 & 5 | T | 206F | Bothne |
| 101-102 | 6† | Modern Norwegian Literature | | Jr., sr. | 3-4 |
| | | 10 | TThS | 206F | Bothne |

| | | | | | |
|---|---|---|---|---|---|
| 103 | 3 | Earlier Norwegian Literature | | Sr., grad. | 101-102 |
| | | 11 | TThS | 206F | Bothne |
| 104 | 2 | Henrik Ibsen ..... | | Sr., grad. | 101-102 |
| | | 11 | TTh | 206F | Bothne |
| 105-106 | 6 | History of Northern Europe. | | Jr., sr., grad. | See statement |
| | | 11 | MWF | 206F | Stomberg |
| 107-108 | 6† | Swedish Literature ..... | | Jr., sr., grad. | 7-8 |
| | | 2 | MWF | 206F | Stomberg |
| 109 | 2 | Strindberg ..... | | Sr., grad. | 107-108 |
| | | Ar | Ar | 206F | Stomberg |
| 110 | 2 | Teachers' Course in Norweg. | | Sr., grad. | 3-4 |
| | | 4 & 5 | Th | 206F | Bothne |
| 113-114 | 4 | Old Norse (Icelandic) ..... | | Sr., grad. | See statement |
| | | Ar | Ar | 206F | Bothne |
| 116 | 2 | Teachers' Course in Swedish. | | Sr., grad. | 7-8 |
| | | Ar | Ar | 206F | Stomberg |

* Freshmen must complete intermediate course before credit is given for beginning course.

† Both semesters must be completed before credit is given for the first semester.

110. TEACHERS' COURSE IN NORWEGIAN. For students who expect to teach Norwegian in the high schools. BOTHNE.

116. TEACHERS' COURSE IN SWEDISH. For students who expect to teach Swedish in the high schools. STOMBERG.

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 127-129.

## SOCIOLOGY AND ANTHROPOLOGY

Professors ALBERT ERNEST JENKS, ARTHUR J. TODD; Assistant Professor JOSEPH PETERSON; Instructors PAUL I. NEERGAARD; Lecturers FRANK J. BRUNO, OTTO W. DAVIS, CHARLES G. STILLMAN, GEORGE EDGAR VINCENT; Superintendents of State Board of Control Institutions.

### REQUIREMENTS OF THE DEPARTMENT

*For a Minor,* twelve credits.

*For a Major,* twenty-four credits.

*For B.A. with Honors,* see general requirements (page 15).

*For Recommendation for Teaching,* credits in the following courses: 1, 4, 6, and two advanced courses.

Modern university education is not complete unless the graduate has obtained the social point of view. To this end the department offers elementary courses dealing with peoples, with social forces, institutions, and movements. Its more advanced courses are designed especially for students majoring in the Social Sciences; namely, Sociology and Anthropology, Economics, History, and Political Science.

## COURSES

*Introductory Courses*

| No. | Credit | Title | | Offered to | Prereq. courses |
|---|---|---|---|---|---|
| 1a | 3 | General Introduction ..... | | Soph., jr., sr. | None |
| | | 8 | MWF | 203He(F) | Neergaard |
| | | 10 | MWF | 9F | Jenks |
| | | 10 | TThS | 9F | Todd |
| | | 2 | MWF | 301F | Neergaard |
| 1b | 3 | 2 | MWF | 301F | Neergaard |
| 4 | 3 | Cult. Anthropology ..... | | Soph., jr., sr. | 1a or 1b |
| | | 2 | MWF | 9F | Jenks |
| 6 | 3 | Soc. Reform Movements.... | | Soph., jr., sr. | 1a or 1b |
| | | 11 | TThS | 9F | Todd |

*Special Courses*

| | | | | | |
|---|---|---|---|---|---|
| 7 | None | Studies in Soc. Psychology. | | Stud. in Dept. | None |
| | | See statement | | | Vincent |

*General Courses*

| | | | | | |
|---|---|---|---|---|---|
| 9 | 3 | Treatment of Depend. & Def.. | | Jr., sr. | 1 |
| | | 8 | TThS | 9F | Bruno |
| 10 | 3 | Child Welfare ..... | | Jr., sr. | 1 and 9 |
| | | 8 | TThS | 9F | Stillman |
| 11 | 2 | Housing Problems ..... | | Jr., sr. | 1 and one other |
| | | 9 | MW | 9F | Davis |
| 12 | 3 | Ethnology ..... | | Jr., sr. | 1 and one other |
| | | See statement | | | Jenks |
| 14 | 3 | Rural Community ..... | | Jr., sr. | 1 |
| | | 8 | MWF | 203He(F) | Neergaard |
| 21-22 | 1 | Field Work ..... | | Jr., sr. | See statement |
| | | Ar | Ar | Ar | Ar |

*Advanced Courses*

| | | | | | |
|---|---|---|---|---|---|
| 102 | 3 | Social Theory ..... | | Jr., sr., grad. | 1, 9 or 10, and 1 other |
| | | 9 | TThS | 9F | Neergaard |
| 104 | 2 | State Care of Dep., Def., and Delinquents ..... | | Jr., sr., grad. | 1, 9 or 10, and 1 other |
| | | 3, 4 | F | 9F | Todd and state experts |
| 106 | 3 | Treatment of Delinquents .. | | Jr., sr., grad. | 1, 9 or 10, and 1 other |
| | | 8 | MWF | 9F | Todd |
| 108 | 3 | Philippine People ..... | | Jr., sr., grad. | 1 and one other |
| | | 10 | MWF | 9F | Jenks |
| 110 | 3 | Physical Anthropology ..... | | Jr., sr., grad. | See statement |
| | | 2 | MWF | 9F | Jenks |
| 112 | 3 | American Negro ..... | | Jr., sr., grad. | 1, 12, or 113 & 1 other |
| | | See statement | | 9F | Jenks |
| 113 | 3 | American People ..... | | Jr., sr., grad. | 1, and two others |
| | | 11 | MWF | 9F | Jenks |
| 114 | 3. | American People (continued) | | Jr., sr., grad. | 1, 113, and one other |
| | | 11 | MWF | 9F | Jenks |
| 117 | 3 | Social Psychology ..... | | Jr., sr., grad. | See statement |
| | | 9 | TThS | 311½F | Peterson |
| 119 | 3 | The Family ..... | | Jr., sr., grad. | 9 credits |
| | | 11 | TThS | 9F | Todd |
| 120 | 3 | Social Progress ..... | | Sr., grad. | See statement |
| | | 10 | TThS | 9F | Todd |
| 121-122 | 2(each) | Seminar in Sociology.... | | Sr., grad. | For. sr. 4 correlated |
| | | See statement | | 9F | Todd |
| 123 | 3 | Seminar in Anthropology:.. | | Sr., grad. | For. sr. four related courses |
| | | 2, 3 | Th | 205L | Jenks |

All of the above courses receive credit in the College of Education. For description see College of Science, Literature, and the Arts bulletin, pages 129-133.

# INDEX

# Bulletin of The University of Minnesota

# THE GRADUATE SCHOOL

## 1916-1917

VOL. XIX, NO. 14, AUGUST 1916

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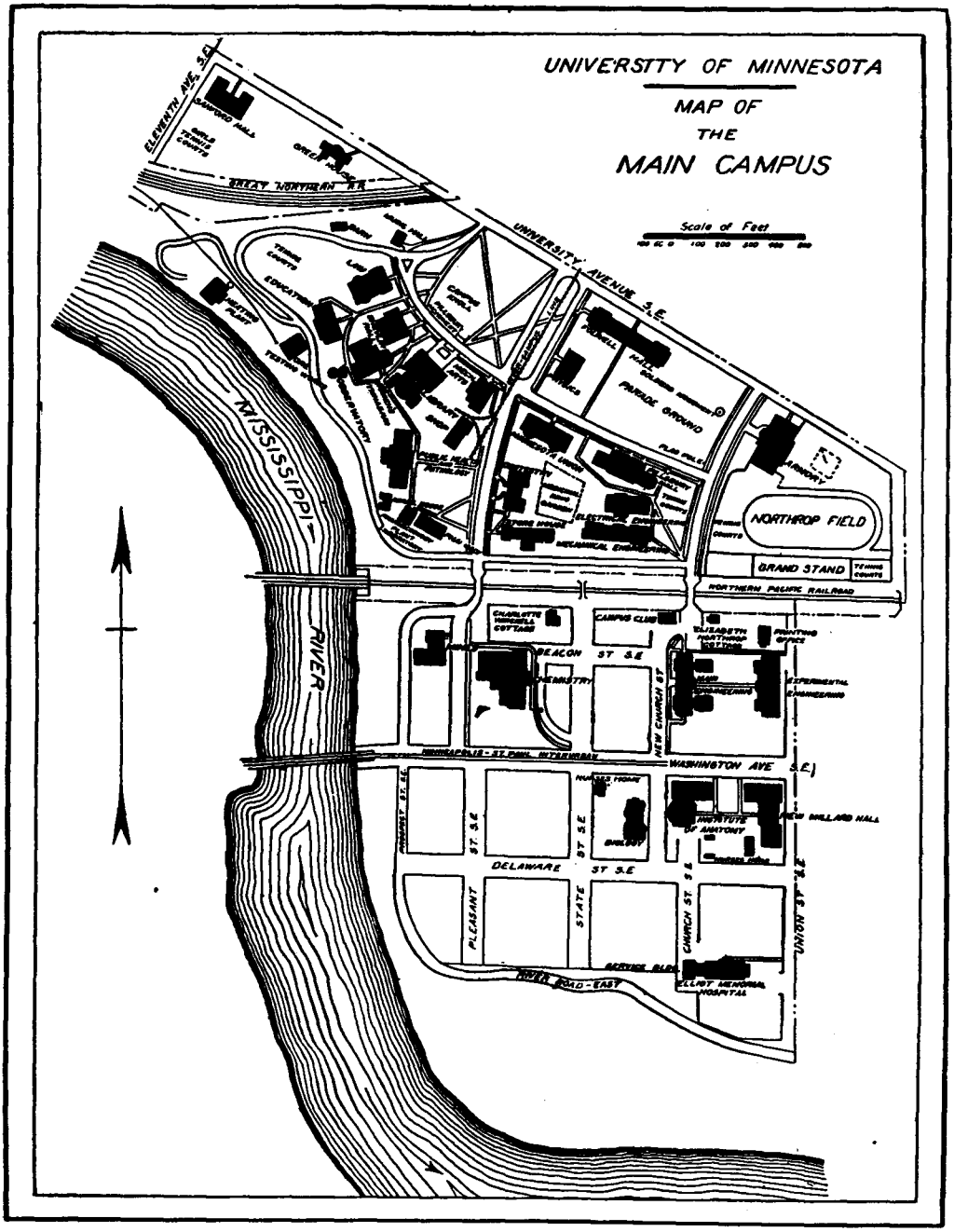
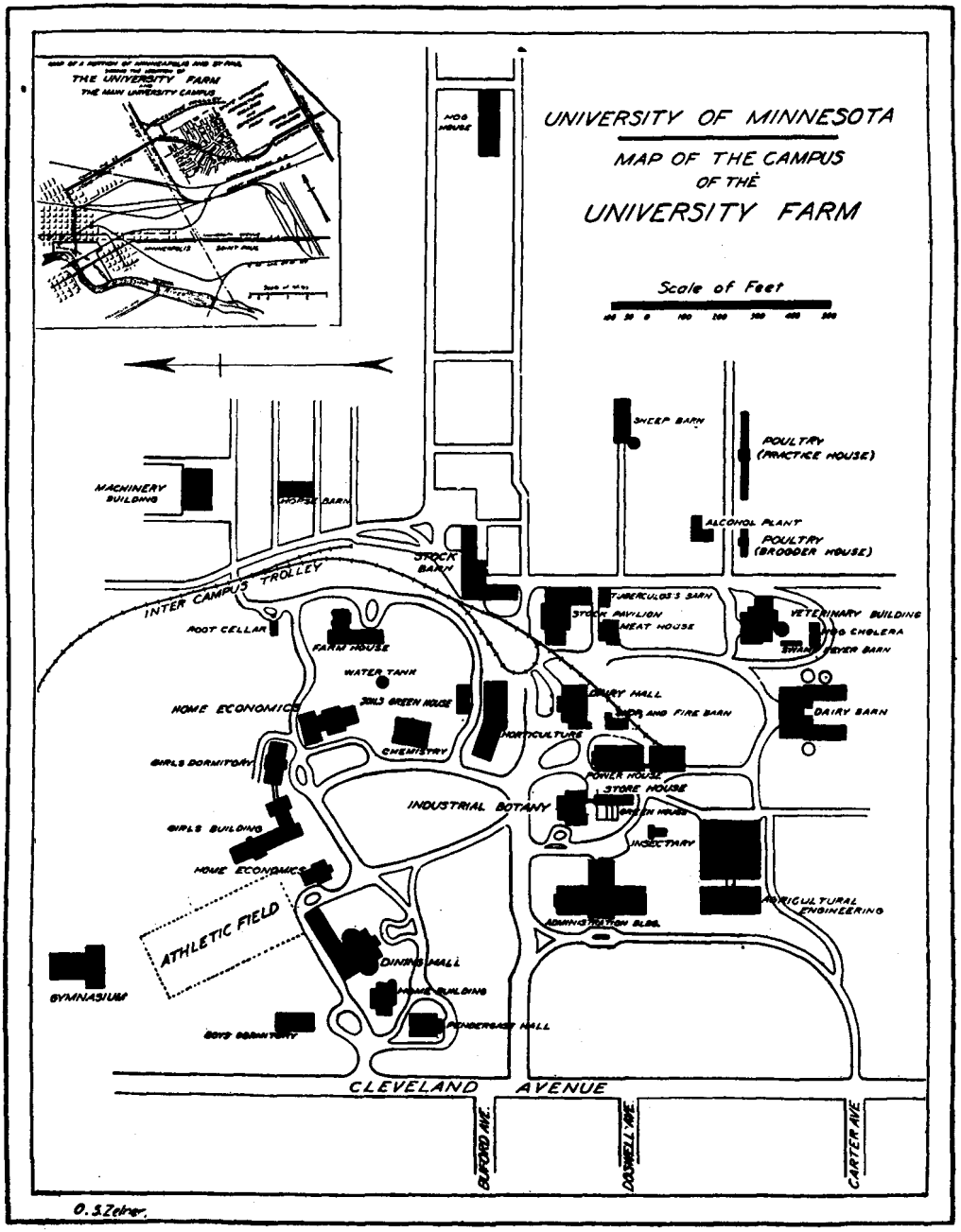



Area of Main Campus, 108.5 acres




Area of University Farm, 422.56 acres

## 1916

### JULY

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### AUGUST

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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## 1917

### JANUARY

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### FEBRUARY

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### MARCH

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### APRIL

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### MAY

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### JUNE

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### JULY

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### AUGUST

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### SEPTEMBER

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| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
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### OCTOBER

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### NOVEMBER

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### DECEMBER

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| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | .. | .. | .. | .. | .. |

# UNIVERSITY CALENDAR

(As applicable to the Graduate School)

## 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 19-26 | Week | Registration of new students and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 7 | Saturday | Last day for registration of graduate students without penalty |
| November | 15 | Wednesday | Last day for filing at the Dean's office of all thesis subjects as approved by the Department Committees |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 9 | Saturday | Last day for final examinations in the field of the minor of candidates for the Doctor's degree |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| 1917 | | | |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 24 | Wednesday | Registration for second semester closes |
| February | 1 | Thursday | Last day for filing at the Dean's office notice of candidacy for the Doctor's degree |
| February | 7 | Wednesday | Second semester begins |
| February | 12 | Monday | Lincoln's Birthday; a holiday |
| February | 17 | Saturday | Last day for registration of graduate students without penalty |
| February | 22 | Thursday | Washington's Birthday; a holiday |
| March | 1 | Thursday | Last day for filing applications for the Shevlin Fellowships and Howard Scholarship and departmental scholarships |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| May | 1 | Tuesday | Last day for filing at the Dean's office of final notice of candidacy for the Master's degree at the coming Commencement |

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| May | 17 | Thursday | Last day for written examinations in the field of the major of candidates for the Doctor's degree. Last day for filing at the Dean's office of three copies of all theses submitted for the Doctor's degree |
| May | 18 | Friday | Last day for filing at the Dean's office of three copies of completed Master's thesis |
| May | 30 | Wednesday | Memorial Day; a holiday |
| May | 31 | Thursday | Last day for oral examination and certification to the Dean of successful candidates for the Doctor's degree<br>Last day for meeting Department Committees to pass on or examine orally candidates for the Master's degree |
| June | 10 | Sunday | Baccalaureate service |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 18 | Monday | Summer Session begins |

The University year for 1917-1918 will begin Tuesday, September 18.

# THE GRADUATE SCHOOL

## ORGANIZATION

The Graduate School has exclusive control of all graduate work carried on in the University. The administration of the 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 Graduate Faculty is composed of those properly approved as qualified to offer courses carrying graduate credit.

## ADMISSION

Any graduate holding a Bachelor's degree or its equivalent from a reputable college or university will be admitted to the Graduate School without examination, and may register for such graduate work as he may be found prepared to enter upon, but he will not thereby be admitted to candidacy for either of the higher degrees until his case has been duly considered and approved by the Executive Committee.

All inquiries concerning admission to the Graduate School should be addressed to the Dean. The student is advised to obtain and fill out an application for admission before presenting himself for registration.

If the rating of the institution from which he received his first degree is such that he will need a year's additional work before beginning real graduate work at the University of Minnesota, he would do better 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 unclassed students in the college giving the work.

## REGISTRATION

Full directions concerning registration will be found in a booklet issued by the Registrar's office for the information of new students.

## FEES

All students taking full work in the Graduate School except those in clinical medicine and surgery are required to pay an incidental fee of fifteen dollars a semester, or a proportionate fee for less work. The tuition fee for graduate work in medicine and surgery is twenty-five dollars a semester. Fellows, scholars, and members of the scientific and instructional staff in the University may register for graduate work without payment of fees or tuition.

## THE SHEVLIN FELLOWSHIPS

Four graduate fellowships have been established by the late Thomas H. Shevlin, of Minneapolis, each yielding $500 per annum. They are

awarded annually. Candidates for these fellowships will 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.

### 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.

### CLASS OF 1890 FELLOWSHIP

On the twenty-fifth anniversary of its graduation the class of 1890 founded a fellowship yielding $150 and exemption from tuition. This fellowship is open to graduates of the Colleges of Science, Literature, and the Arts, and Engineering desiring to pursue advanced work. Applications should be filed with the Dean of the Graduate School before March 15.

### DEPARTMENTAL SCHOLARSHIPS

Besides the above stipends there are about seventy scholarships assigned to various departments, yielding $225 and exemption from tuition and fees. The holders may be required to render services not to exceed ten hours a week in laboratory or office work, or more than three hours in classroom assistance. Where these regulations are observed, a qualified holder of one of these scholarships may become a candidate for the Master's degree on the basis of one year's work in residence.

Other assistantships, some yielding as high as $600, as well as teaching fellowships at $600, are available, but the amount of work required is greater and the length of residence of the holder of one of these appointments would be increased proportionately.

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.

### CANDIDACY FOR A DEGREE

Students may become candidates for advanced degrees, either the Master's or Doctor's, only on recommendation of the group committee in the field of their major work and with the approval of the Executive Committee of the Graduate Faculty.

Among the conditions affecting such approval will be the quantity and quality of the undergraduate work which the candidate has done in the subjects he desires to pursue as major and minor work. The major work must be in a department in which the candidate has had at least three years of work (eighteen credits) if it be a department open to freshmen, or two years of work (twelve 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.

The minor subject must be selected in a department in which the candidate has had at least one year's work (six credits), or he must have

had in a closely allied department a year's work (six credits), which is actually designated as a prerequisite to the minor subject.

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 executive committee of the graduate faculty may in exceptional cases allow the minor subject to be taken in the same department as that of the major.

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, 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 first semester, a certificate of proficiency in the designated language, signed by the professor in charge.

## REQUIREMENTS FOR THE MASTER'S DEGREE

The requirements for the degree of Master of Arts or Master of Science are covered by the statement that these degrees may be earned by properly qualified students only by at least one full academic year's work in residence at this University. Students who have not adequate preparation in the specific chosen field of work, or who are doing outside work in excess of ten hours a week, will be required to devote more than one year to attain the Master's degree. The work of that year must cover courses in the fields of the major and minor and the preparation of a satisfactory thesis. Attention is called to the specific departmental statements of prerequisites demanded of candidates 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 Master's thesis.*—Before the fifteenth of November the candidate should file at the office of the Graduate School the subject of his thesis. This subject must be approved by his adviser and by the Executive Committee. It should be on a topic falling within the field of the major. It is expected that the candidate will devote approximately one half his time to the preparation of this thesis. The thesis must be finished and three copies deposited in the office of the Dean of the Graduate School by the eighteenth of May of the year in which he presents himself as a candidate for the degree. 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 bound copies of the Master's thesis shall be cataloged in the University library.

*Form of thesis.*—The thesis is required to be in triplicate in order to facilitate its consideration. One copy must be upon the specially required linen stock and the other two may be carbon copies on cheap paper. 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 foot-notes may be single spaced.

*Courses.*—Candidates for advanced degrees must select, with the approval of their adviser and of the Dean, graduate courses offered in this Bulletin amounting to not less than six or more than nine scheduled hours each semester. The usual study list of a candidate for the Master's degree will carry the thesis, two courses in the major, and one in the minor.

In general it should be noted that graduate courses are intensive in character and require more of the student's time than do undergraduate courses.

No work done "in absentia" shall be accepted toward a Master's degree unless approved by the executive committee of the graduate school.

*Examinations.*—All candidates for this degree will meet the regular requirements as to examinations, topics, reports, etc., of the classes in which they are registered.

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 the acceptance of the thesis, an oral examination upon the work specifically offered for the degree and other work fundamental thereto. The oral examination shall be open to all members of the graduate faculty and written notices shall be sent to all members of the graduate faculty in the major and minor departments.

*The candidate's committee.*—When the thesis subject has been announced and approved, the Dean, on the recommendation of the group committee, will appoint a committee of three to have general supervision of the candidate's work and pass upon the acceptability of the thesis. If the major and minor subjects are taken in the same department, the candidate's committee shall include one member who is not a member of the department in question. The instructor in charge of the student's major work will, as a rule, be chairman of this committee. This chairman shall have charge of the special written and oral examinations at the end of the year. The report of the committee upon the thesis must be unanimous as to its acceptability. All reports concerning examinations, thesis, etc., must be in the office of the Dean of the Graduate School at least one week before Commencement.

## DOCTOR'S DEGREES

Two degrees of this grade, namely, Doctor of Philosophy (Ph.D.), and Doctor of Science (D.Sc.), are conferred for attainments still more advanced than are required for the corresponding Master's degrees. The Doctor's degree is granted, not on the basis of successful completion of a definite amount of prescribed work, but solely in recognition of the

candidate's high attainments and ability in his special field, to be shown, first, by the preparation of his 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 the subjects approved for candidacy, of which the last year must be spent in residence at the University of Minnesota.

This requirement of time devoted exclusively to work toward the degree will not be met by candidates who merely devote the intervals of professional or other regular employment to graduate work. Such candidates will sometimes need to spend a period two or three times as long as that just mentioned. It is usually not advisable for persons so engaged to try to become candidates for a Doctor's degree, but rather to undertake only such special graduate work as they may find to their advantage, without reference to any degree.

Members of the staff of instruction above the rank of instructor will not be permitted to take a Doctor's degree at this University. There is no objection, however, to their registering for graduate work at this University and credit so obtained may be presented elsewhere.

*Preliminaries to candidacy.*—A graduate student applying to be enrolled as candidate for a Doctor's degree should fulfill the requirements already specified for those applying for the Master's degree and, in addition, possess a reading knowledge of French and German certified to by the professors respectively in charge of those languages not later than the beginning of the last year of residence. Knowledge of Latin will also be required in certain cases, when, for example, the major is in medieval history, or philosophy, as the department may prescribe.

The applicant must, moreover, have made before enrollment such noteworthy advancement in his major as to secure the written approval of his candidacy by the department in which he proposes to take his major.

Such written approval should state that in view of the work already done by the applicant the department has become convinced of his capacity and of his probable ability to carry through an investigation in his special field to a successful conclusion and embody it in a satisfactory thesis, and furthermore is prepared to accept him as candidate.

This approval of the department will after due consideration be passed on by the Executive Committee. It will frequently not be possible to secure such enrollment before the completion of one year of study in the Graduate School, but it must be secured at least a year before attaining the degree.

*Preliminary work, major and minor work.*—The requirements already detailed in reference to the distribution and kind of work for the Master's degree hold for the Doctor's degree also, but in this case the special problem for the thesis must be selected with the advice and consent of the department committee in which the candidate's major lies, at least one year before the degree is to be conferred. Announcement of the fact must be transmitted to the Executive Committee through the Dean, to-

gether with the written approval of the department, before the beginning of the last academic year. On recommendation of the department committee of the major, the Executive Committee may excuse the candidate from complying with the above requirement as to a part or the whole of the additional courses, in order that more time may be devoted to the thesis. The work upon the minor should not extend into the candidate's final year.

*Preliminary notice.*—Each candidate for a Doctor's degree at any Commencement will notify the Dean in writing by the first of the preceding February of his intention to present himself for the degree, and he will make a full statement of the work which he will offer for the degree, his major, his minor, and the subject of his thesis, together with the names of those with whom the work is being done. The statement should be endorsed as approved by the chairman of his major department.

*Examinations for the Doctor's degree.*—Candidates for the Doctor's degree are required to take the regular examinations in all the courses for which they are registered, as in the case of the Master's degree.

Candidates are required to take two degree examinations, a preliminary and a final. The preliminary degree examination is a written examination upon the minor subject or subjects given by the department committees concerned. Upon recommendation of a department committee, this examination may be given in connection with the courses taken by the candidate, provided that such examination be a more exhaustive one than that given to other students taking such courses. When the preliminary examination is not given in connection with a course, it shall be taken not less than six months prior to the final examination. All such examinations must be approved as satisfactory by the department committee concerned and so certified to on the candidate's registration book before he can be admitted to final examination on his major, and when so certified to will be final for that subject.

*The thesis* 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, and the thesis must contain such extended references to the bibliography of the subject as to make it in every way a scholarly production.

It must be approved as satisfactory by the candidate's committee before he can be admitted to his final oral examinations.

*Presentation of Doctor's thesis.*—At least four weeks before Commencement the candidate will deposit at the Dean's office his thesis typewritten in triplicate copy to facilitate reading by the committee. No special size or form is required, since it is to be printed subsequently.

*The candidate's committee.*—In case of the Doctor's degree the candidate's committee will include the same members as in the case of the Master's degree, and will be enlarged so as to include, besides these, the department committees in which the candidate's major and minor sub-

jects lie, and such other members of the Faculty as the Dean may appoint. It is the duty of the chairman to call the meetings of this committee and duly inform the Dean in writing, of the time and place of such meetings as are held for final oral examinations.

*Doctor's final examinations.*—The final examinations on the major will be both written and oral.

The written examinations will occur at least four weeks before commencement, and will be conducted by the department committee of the candidate's major. It will cover in an exhaustive manner the whole field of the major.

If the thesis, as well as the written examination on the major, are adjudged to be satisfactory, and all other requirements have also been met, the candidate's committee, enlarged as previously provided for, will be convened by its chairman at least two weeks before Commencement and proceed to the final oral examination. At the conclusion of the oral examination, after the candidate is withdrawn, the committee will canvass the work of the candidate as a whole, and in case it regards him as entitled to his degree, it will report the fact to the Dean at least twelve days before Commencement, and transmit to him for the use of the Executive Committee, two copies of the thesis and the final written examination papers of the major and minor subjects, together with his registration book.

*Printing thesis, etc.*—The candidate will have a copy of his thesis deposited in the office of the Graduate School one week before Commencement. At the same time the candidate will deposit with the Registrar a sufficient bond or such sum of money as will be required to print one hundred copies of it for the use of the University, and as many additional copies as the candidate may order for himself.

*Presentation to the Faculty.*—Each candidate recommended by the Executive Committee of the Graduate School for a Doctor's degree will be presented at a meeting of the Faculty called for the purpose, by the professor in charge of his major subject, who will then read a written statement of the academic life of the candidate, of the character and scope of his examinations, and the scope and value of his thesis.

The candidate will be asked to give a brief outline of his research, and any member of the Faculty will then be at liberty to propound any questions he will respecting the candidate to his instructors or to the candidate himself respecting his work. Upon the evidence before it the Faculty will then decide by vote whether the candidate shall be recommended to the Regents for his degree.

## GRADUATE WORK IN THE SUMMER

Work of graduate character done in the Summer Session of the University of Minnesota under a member of the Graduate Faculty may be counted for residence credit for advanced degrees. The course work for the Master's degree may be completed in four summer sessions. The rest of the residence needed to cover the academic year of thirty-six

weeks may be completed after the thesis is begun by registering early and remaining in residence working under direction after the Summer Session has closed. Students working for the Master's degree in Summer Sessions must file the subjects of their theses before the completion of the first half of the required work.

An increasing amount of graduate work in fields of interest to high-school teachers is being offered in the Summer Session. The courses for any session may be found in the bulletin of the Summer Session.

Students who intend to offer work in the summer for an advanced degree should register for purposes of record with the Dean of the Graduate School.

Members of the Graduate Faculty may, with the approval of the Dean, offer summer work for graduate students apart from the work regularly listed in the Summer Session bulletin. Students taking such properly authorized summer work may be allowed by the Executive Committee to substitute it for an equal amount of residence during the academic year.

## GRADUATE WORK IN MEDICINE

Besides the graduate work in the laboratory departments of the Medical College announced in this bulletin, graduate work 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. 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 of the residence work may be done. A number of teaching fellowships supported by the University and others on the Mayo Foundation are open to qualified students pursuing graduate work in clinical medicine. A special bulletin covering this work may be obtained from the Registrar.

## WORK IN THE LAW SCHOOL

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 departments of Political Science or Economics.

# DEPARTMENTAL STATEMENTS

In the following description of courses the prerequisites for the individual course and the number of credits carried by that course are given in this order just before the name of the instructor.

## AGRICULTURAL CHEMISTRY

Professor ROSCOE THATCHER; Associate Professor .....; Assistant Professors CLYDE H. BAILEY and JOHN J. WILLAMAN.

*Prerequisites.* For major work, a minimum of six credits each in general chemistry and qualitative analysis, in organic chemistry, and in quantitative analysis; twelve credits in biological science, and four credits in college physics. For minor work, six credits in general chemistry and qualitative analysis, three credits in organic chemistry, and twelve credits in biological science.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. QUANTITATIVE ANALYSIS. The principles involved in gravimetric and volumetric analyses. The course includes the gravimetric determination of iron, sulfur, phosphorus, magnesium, and chlorine; acidimetry, alkalimetry; the volumetric determination of iron and calcium; and iodimetry. Five credits. WILLAMAN.

102. AGRICULTURAL QUANTITATIVE ANALYSIS. Methods of proximate analysis of agricultural products, including the determination of moisture, ash, fats, starch, sugars, fiber, proteins, and the different nitrogenous constituents of foods and feeding stuffs. Five credits. WILLAMAN.

105. DETECTION OF ADULTERATION OF FOODS AND FEEDING STUFFS. The use of proximate analyses and special tests for the determination of quality and the detection of adulteration of foods and feeds. Includes chemical and microscopical examinations. Three credits. WILLAMAN.

106. AGRICULTURAL PRODUCTS AND BY-PRODUCTS. The composition of the principal products and by-products of agriculture and their utilization as raw material in various industries, and the methods of chemical control work in these industries. Three credits. BAILEY.

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. Two credits. BAILEY.

110. FLOUR LABORATORY METHODS. A laboratory course in the methods of analyses of wheat and its products; milling tests of wheat; and baking and special tests of flour. Three credits. BAILEY.

111. BIOCHEMISTRY. An advanced course in the chemistry of fats, carbohydrates, tannins, proteins, enzymes, and colloids, and their relation

to the vital processes involved in plant and animal growth and nutrition. Three credits. THATCHER.

113. BIOCHEMICAL LABORATORY METHODS. Special methods of examination of plant and animal tissues for particular fats, carbohydrates, proteins, and enzymes. Two credits. .....

116. COLLOIDS. An advanced study of the colloidal condition, of the preparation and properties of collodial solutions, and the relation of these to biochemical processes. (Offered in alternate years, not offered in 1916-17.) Three credits. .....

118. ENZYMES. An advanced study of the nature of enzyme action including methods of preparation and investigation of enzymes, their physical and chemical properties and their method of action. (Offered in alternate years, offered in 1916-17.) Three credits. THATCHER.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. SEMINAR. Regular meetings for the discussion of methods of research, formulation of research problems, and reviews of current literature. One credit. THATCHER.

203-204. 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, animal, or human nutrition. Three or five credits. THATCHER, or .....

## AGRICULTURAL EDUCATION

Professors ASHLEY V. STORM, WILLIAM F. LUSK; Associate Professor WILBUR H. BENDER.

*Prerequisite.* For major or minor work, fifteen credits in Agricultural Education and preparation in agricultural subjects satisfactory to the Graduate Committee of the Department of Agriculture. Exemption from the language requirement for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

131a,b. METHODS IN TEACHING HIGH-SCHOOL AGRICULTURE. Method in teaching as distinctly related to teaching agriculture in the high school. Organization of subject matter, and the selection and manipulation of devices. Classroom and laboratory method. Specific plans for teaching secondary agriculture. Three credits. BENDER.

141a,b. TEACHING. Observation of regular classes; interpretation of class practices; 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's teaching. Three credits. STORM, BENDER, LUSK.

151a,b. ORGANIZATION AND MANAGEMENT. Organization and management of work in secondary schools, particularly of Minnesota, with special

reference to agricultural work, courses of study, programs, equipment, laboratory and class management, extension work, plots and coördination of work. Three credits. STORM.

PRIMARILY FOR GRADUATES

221a. GRADUATE PROBLEMS. Making investigations, gathering data and formulating plans regarding agricultural education. Three credits. STORM, BENDER.

## AGRICULTURAL ENGINEERING

Professor JOHN T. STEWART.

Exemption from the language requirements for the Master's degree may be made in individual cases.

PRIMARILY FOR GRADUATE STUDENTS

202. SPECIAL PROBLEMS. Open to graduates of Engineering and Agricultural Colleges. Investigation, collection of data, and compilation of facts, relating to various problems of engineering applied to agriculture. Offered to students having necessary preparation for line of work. Three credits. STEWART.

## AGRONOMY AND FARM MANAGEMENT

Professor ANDREW BOSS; Associate Professor HERBERT K. HAYES; Assistant Professor MAXWELL J. DORSEY.

*Prerequisites.* In Farm Crops and Plant Breeding, for major work, Courses 103, 106, and 107 or their equivalents, and a reading knowledge of German. For minor work, two years of botany, one year of zoology, and the elementary courses in farm crops.

In Farm Management, for major work, Courses 102 and 105 or their equivalents, and at least six credits in elementary and agricultural economics. For minor work, at least twelve credits in elementary agricultural sciences (as Farm Crops I, Soils 3 and 4, Animal Husbandry 3 and 7). Exemption from the language requirement for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

102. FARM MANAGEMENT II. A course in which the business side of farming is emphasized. Special attention is given to farm organization, equipment and operation. Three credits. BOSS.

103. PRINCIPLES OF GENETICS. A course of lectures designed to familiarize the student with the underlying principles of breeding. Heredity, variation, and evolution are emphasized. Three credits. HAYES, DORSEY.

105. FARM MANAGEMENT PROBLEMS. An advanced course, including a study of farm practices, farm equipment, cost of production, and efficiency of labor. Three credits. BOSS.

106. PLANT BREEDING. A course which emphasizes the practical side of plant breeding. The method of breeding each of the important crops is studied separately, with attention to experiment station investigations and to methods used by plant breeders. Three credits. HAYES, DORSEY.

107. FARM CROPS II. A systematic study of the form and structure of the entire plants of the cereal, forage, fiber, and root crops adapted to the North Central states. Three credits. BOSS.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. ADVANCED PLANT BREEDING. Research problems in plant breeding with opportunities for original investigation. HAYES.

203-204. GENETICS SEMINAR. A discussion of the broader genetic problems, applied biology, and the recent advances in genetic work. Weekly meetings throughout the year. HAYES, DORSEY.

205-206. ADVANCED FARM MANAGEMENT. Research problems in organization and operation of large farm enterprises. BOSS.

207-208. FARM MANAGEMENT SURVEYS. Research work in farm management surveys of a certain territory, or of special types of farming. BOSS.

209-210. Research problems in farm crops. BOSS.

## ANATOMY

Professors CLARENCE M. JACKSON, JOHN B. JOHNSTON, THOMAS G. LEE, RICHARD E. SCAMMON.

The new 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 majoring or minoring in the department of anatomy includes general zoology (animal biology), 6 credit hours, and advanced zoology or elementary courses in anatomy (including histology, embryology and neurology), 6 hours. In addition each student majoring 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 the description of courses, see the special bulletin of Graduate Work in Medicine.

## ANIMAL BIOLOGY

Professors HENRY F. NACHTRIEB, JOHN B. JOHNSTON, CHARLES P. SIGERFOOS; Associate Professor HAL DOWNEY; Assistant Professors ELMER J. LUND, OSCAR W. OESTLUND; Instructor CHARLES E. JOHNSON.

*Prerequisites.* For major work, Course 1-2 and twelve credits of advanced work approved by the department; for minor work, Course 1-2 or the equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101-102. ADVANCED ENTOMOLOGY. Advanced work in the ecology and taxonomy of insects. Lectures, laboratory, and field work. Animal Biology 23-24. Six credits. OESTLUND.

117-118. MAMMALOGY. Structures and classification of North American mammals. The mammalian skeleton; its modifications; consideration of our domestic animals; dissection of a typical mammal. Classification, natural history and geographic distribution with special reference to Minnesota mammals. JOHNSON.

119-120. VERTEBRATE HISTOLOGY. Primarily advanced work on vertebrate tissues. Conference, reference, and laboratory work. Animal Biology 7-8, 12. Six credits. DOWNEY.

123-124. BLOOD OF VERTEBRATES. A comparative study of blood and blood-forming organs of vertebrates. A portion of the time devoted to research. Animal Biology 131-132. Six or twelve credits. DOWNEY.

131-132. EMBRYOLOGY. A brief survey of general embryology and the organogeny of the vertebrates with special reference to the circulatory system. Conference, reference, and laboratory work with Kellicott's *General Embryology,* and *Outlines of Chordate Development* as texts. Animal Biology, 7-8. Six credits. NACHTRIEB.

143-144. GENETICS AND EUGENICS. Facts and theories of heredity and the application of the laws governing natural inheritances for the improvement of a race. Lectures, reference, conference, and laboratory work. Animal Biology 7-8, 15-16. Six credits. NACHTRIEB.

161-162. PROBLEMS. Advanced work in some special line. DOWNEY, JOHNSON, JOHNSTON, LUND, NACHTRIEB, OESTLUND, SIGERFOOS.

COURSES FOR GRADUATE STUDENTS

Hours and days for advanced graduate work are arranged with the instructor in charge of the line of work to be pursued.

201-202. Research in entomology. OESTLUND.

215-216. Research on the morphology of vertebrates. JOHNSON.

217-218. Research on the gross and microscopic anatomy of the Ganoids. NACHTRIEB.

219-220. Research in animal histology. DOWNEY.

221-222. Research on vertebrate connective tissue with special reference to the cellular elements. DOWNEY.

223-224. Research in vertebrate hematology. DOWNEY.

237-238. Research in vertebrate embryology. NACHTRIEB.

241-242. COMPARATIVE NEUROLOGY. A study of the structure and functions of the nervous system of vertebrate animals and of the evolution of

the chief nervous mechanisms. Two years in Comparative or Human Anatomy. Six credits. JOHNSTON.

243-244. Research in Neurology. JOHNSTON.

249-250. GENERAL PHYSIOLOGY. Chemical and physical composition of cells, and their environmnets. Interpretation of nutrition, secretion, enzyme action, permeability, stimulation, cell division, growth, regeneration, acclimatization from the viewpoint of the science of solution and energetics. LUND.

251-252. Research in the physiology of the lower organisms with special reference to the Protozoa. LUND.

## ANTHROPOLOGY

See Sociology and Anthropology

## ASTRONOMY

Professor FRANCIS P. LEAVENWORTH; Assistant Astronomer WILLIAM O. BEAL.

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 and Mathematics 7 and 11; for minor work, Mathematics 7 and 11 and three 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

101-102. PRACTICAL ASTRONOMY. Theory and use of astronomical instruments in determining time, latitude, longitude, positions of heavenly bodies; astronomical photography, with measures of plates; study of the method of least squares. Mathematics 11. Three or six credits. LEAVENWORTH.

140. METHOD OF LEAST SQUARES. The combination and adjustment of observations and the discussion of their precision as applied especially to engineering physics, and astronomy. Mathematics 51. Two credits. LEAVENWORTH.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. ADVANCED PRACTICAL ASTRONOMY. Astronomy 102. Three credits. LEAVENWORTH.

205-206. ASTROPHOTOGRAPHY. Photography of the heavenly bodies, measurement of plates, determination of positions, parallax, etc. Astronomy 102. Three credits. LEAVENWORTH.

209-210. CALCULATION OF ORBITS. Mathematics 51. Three credits. BEAL.

211-212. CELESTIAL MECHANICS. Mathematics 51. Three credits. BEAL.

## BOTANY

Professors FREDERIC E. CLEMENTS, CARL OTTO ROSENDAHL, JOSEPHINE E. TILDEN; Assistant Professors FREDERIC K. BUTTERS,* HERBERT F. BERGMAN.

*Prerequisites.* For major work, twenty-four credits; for minor work, two two-year courses, one introductory and one intermediate.

The graduate courses in Botany are designed to prepare students directly for scientific positions in the United States Department of Agriculture and in the agricultural colleges and experiment stations of the various states. Such positions are those of ecologist, physiologist, systematic botanist, mycologist, agrostologist, algologist, etc., in the Bureau of Plant Industry, and of ecologist in the Forest Service. In coöperation with the Department of Plant Pathology and Botany in the College of Agriculture, training is given for the positions of plant pathologist and of seed expert in the Bureau of Plant Industry and in the state experiment stations. Positions in some of these lines are open to women as well as men. In addition to the general courses which are prerequisites, Courses 101-102, 105-106, 111-112, 115-116, and 119-120 are most important in this preparation, followed by still more advanced courses determined by the training sought.

### FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

101-102. APPLIED ECOLOGY. A study of the physiological processes and the ecological principles and methods involved in the production of field, garden and forest crops. Either semester open to students who have had introductory botany, physiology, and ecology. Six credits. CLEMENTS.

103. PLANT FOODSTUFFS AND TEXTILES. A special study of the botany of foods, textile fibers and fabrics, together with an inquiry into the relation of plants to household processes and problems. For young women. Nine credits prerequisite. Three credits. TILDEN.

105-106. ALGAE. A detailed comparative study of the structure and classification of the algae, including an examination of the blue-green and green freshwater forms and the more important brown and red marine species. Nine credits prerequisite. Six credits. TILDEN.

107-108. COMPARATIVE MORPHOLOGY OF MOSSES AND FERNS. Designed for students who wish to pay special attention to the morphology and taxonomy of liverworts, mosses, and ferns. Lecture, laboratory, and field work. Nine credits, including Botany 2 or 3 or 5-6. Six credits. BUTTERS.

* Absent on leave, 1916-17.

110. MORPHOLOGY AND TAXONOMY OF GYMNOSPERMS. A comparative study of cycads, conifers, and their allies, their structure and history with especial attention to the classificaton of living forms. Lectures, reference reading, and laboratory work. Botany 7-8 or 107-108. Three credits. BUTTERS.

111-112. ADVANCED TAXONOMY. 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. Laboratory, field work, lectures and quizzes. Botany 7-8. Six credits. ROSENDAHL.

113-114. ADVANCED ECOLOGY. Critical study of plant habitats by means of instruments and the adaptations produced by water and light, with a careful examination of causes and reactions of plant formations. Class discussions and quizzes, field and greenhouse work. Botany 9-10. Six credits. CLEMENTS.

115-116. ADVANCED PLANT PHYSIOLOGY. Study of the relations of factor, function, and structure in the various organs of the plant, with special reference to absorption, transpiration, photosynthesis, respiration, irritability, and reproduction. Class discussions and quizzes, greenhouse and field work. Botany 9-10. Six credits. CLEMENTS.

117-118. CYTOLOGY. A survey of cell structure and the various phenomena of division, fusion, and metamorphosis, together with a review of the history of cytological investigation. Methods of cytological research indicated in the laboratory. Eighteen credits prerequsiite. Six credits. ROSENDAHL.

119-120. ADVANCED INDUSTRIAL BOTANY. A study of the origin, distribution and cultivation of plants yielding products of economic value, the nature and uses of these products, and the processes by which they are obtained from the plants. Botany 11-12. Six credits. TILDEN.

## COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. RESEARCH PROBLEMS IN MORPHOLOGY. Research work may be pursued upon the morphology of vascular plants. Important literature and necessary material will be provided for whatever research is entered upon. ROSENDAHL, BUTTERS.

203-204. RESEARCH PROBLEMS IN TAXONOMY. The herbarium of 300,000 specimens of vascular plants offers facilities for monographic work, especially on the plants of temperate North America, and problems in plant geography in the same region. ROSENDAHL.

205-206. RESEARCH PROBLEMS IN ALGOLOGY. Work on special groups or along following lines: fresh-water algae of Minnesota; algae of Minneapolis and St. Paul water supplies; hot spring algae; lime-depositing algae; marine algae, from Vancouver, Hawaiian Islands, Tahiti, New Zealand, Australia. TILDEN.

207-208. RESEARCH PROBLEMS IN PHYSIOLOGY AND ECOLOGY. Research work in ecology and physiology along following lines: the physical factors of the habitat by instruments; plant functions and adaptations; experimental production of new forms; development and structure of vegetation, especially migration, competition, etc. CLEMENTS.

209-210. RESEARCH PROBLEMS IN CYTOLOGY AND EMBRYOLOGY. Research work may be taken along following lines: minute structure of cell; microchemistry of cell; development of sporangia and spores; fecundation; development of embryo; origin and development of primary tissues; development of organs, correlation, etc. CLEMENTS, ROSENDAHL.

211-212. RESEARCH PROBLEMS IN INDUSTRIAL BOTANY. Economic plant material from Tahiti, New Zealand, and Australia is available for original investigation. Certain important food and fiber plants of the tropics are in especial need of study. TILDEN.

213-214. RESEARCH PROBLEMS IN MYCOLOGY. Research work in the taxonomy, physiology-ecology, morphology, and phylogeny of fungi, including the lichens. CLEMENTS.

## CHEMISTRY

Professors GEORGE B. FRANKFORTER, CHARLES F. SIDENER; Associate Professor EVERHART P. HARDING; Assistant Professors IRA H. DERBY, WILLIAM H. HUNTER, EDWARD E. NICHOLSON; Instructors WOLF KRITCHEVSKY, EARLE K. STRACHAN, STERLING TEMPLE, J. GERHARD DIETRICHSON, FRANK H. MACDOUGALL.

*Prerequisites.* For major work, at least six credits in inorganic chemsitry and qualitative analysis, and six credits in quantitative analysis or organic chemistry, this work to be equivalent to the work offered at the University of Minnesota. In addition, at least six credits must be offered in chemistry, physics, or college mathematics. The work presented as prerequisite must be satisfactory to the instructor with whom the student wishes to work.

Candidates for the Master's degree must have a reading knowledge of German.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

106. MINERAL AND ORE ANALYSIS. Theory and practice in accurate analysis of silicate rocks, and the rapid determination of certain constituents of ores. Chemistry 11-12. Two credits. SIDENER.

107-108. ADVANCED QUANTITATIVE ANALYSIS. The work in this course will be adapted as far as possible to the needs and desires of the individual student. Chemistry 11-12. Six credits. SIDENER.

109. WATER ANALYSIS. The course includes an exhaustive discussion of the chemical and sanitary properties of water. Chemistry 11-12. One credit. FRANKFORTER.

113. General Toxicology. A discussion of the chemistry of the various poisonous compounds, both organic and inorganic; also methods of their isolation from animal tissue, together with tests for same. Chemistry 35-36. Two credits. Frankforter.

114. Organic Analysis. Practice in elementary analysis, determination of special groups, and identification of pure compounds. Chemistry 35-36. Three credits. Hunter.

115. Advanced Organic Chemistry. Selected topics: constitution work, quinones, etc.; the study of organic reactions. Chemistry 35-36. Two credits. Hunter.

116. Theoretical Organic Chemistry. This course will take up theories which apply especially to carbon compounds, such as relation of properties to constitution, carbon valence theory, etc. Chemistry 35-36. Two credits. Hunter.

117. The Coal-Tar Dyes. The chemistry of the coal-tar dyes and their intermediate products. Chemistry 35-36. Two credits. Kritchevsky.

118. The Chemistry of the Essential Oils. A discussion of the constituents of the essential oils, including the terpenes and perfumes. Chemistry 35-36. Two credits. Frankforter.

119. Chemistry of the Newer Medicinal Compounds. The course includes a discussion of the chemistry of synthetic organic substances which have medicinal properties. (Continued in Pharmacology second semester.) Chemistry 35-36. Two credits. Frankforter, Hunter.

121-122. Physical Chemistry. Consideration of theories and laws, prenomena and processes forming basis of chemical science. Charts, models, and experiments employed to supplement and illustrate discussions. Open only to those who have had or are taking Course 111-112. Four credits. Derby, MacDougall.

123-124. Physico-chemical Laboratory Practice. Physico-chemical methods and measurement. Open only to students pursuing Course 121-122, or who have had it or its equivalent. Two credits. Derby, MacDougall.

125-126. Advanced Physical Chemistry. Theories of chemistry treated systematically from the standpoint of thermo-dynamics and the molecular theory. Suited to the needs of candidates for the higher degrees and all others interested in the advances of modern physical chemistry. Chemistry 121-122. Six credits. Derby.

128. Radiochemistry. The occurrence, methods of isolation and investigation, and physico-chemical properties of the radioactive substances, together with a brief consideration of the chemical, geological, and biological bearing of the subject. Chemistry 7-8 or 11-12. Two credits. Derby.

129-130. ADVANCED PHYSICO-CHEMICAL LABORATORY. Advanced measurements in physical chemistry adapted to the desires and qualifications of the individual student. Assigned reading will accompany the experimental work. Chemistry 123-124. Three to six credits. DERBY.

131. FOOD ANALYSIS. The course includes the chemical analysis of the various food products and the detection of the common adulterants. Chemistry 11-12. Two credits. HARDING.

132. FOOD ANALYSIS. Continuation of Course 131. Chemistry 11-12. Two credits. HARDING.

134. MICROCHEMISTRY. This course includes the precipitation, examination, and identification of minute quantities of substances, and the examination of food materials, fibers, etc., by means of the microscope. Chemistry 11-12. One credit. HARDING.

135. GAS AND COAL ANALYSIS. Course comprises methods of collecting and storing gases previous to their analysis; methods of manufacturing commercial gases; their chemical analysis, calorific and photometric determination; also ultimate and proximate analysis of coals and their calorific determination. Chemistry 11-12. Two credits. HARDING.

137. PAINT ANALYSIS. This course comprises the quantitative separation of pigments and vehicles; a chemical and physical examination of the vehicles; and qualitative and quantitative analyses of the pigments. Chemistry 11-12. Two credits. HARDING.

141. INDUSTRIAL CHEMISTRY. This course includes the discussion of methods and apparatus used in chemical technology, the testing of commercial chemical products, and excursions. Chemistry 11-12. Three credits. TEMPLE.

142. INDUSTRIAL CHEMISTRY. Continuation of Course 141. Chemistry 35-36, 141. Three credits. TEMPLE.

143. SUGAR CHEMISTRY. The course includes the technology of sugar manufacture. Chemistry 35-36. One credit. NICHOLSON.

144. ELECTROCHEMISTRY. A discussion of electro-analytical methods and industrial electrochemical processes, with their underlying principles. Chemistry 11-12. Two credits. DIETRICHSON.

145. ELECTRIC FURNACES. Theory and practice in the design, construction, and operation of electric furnaces. Chemistry 11-12. Two credits. DIETRICHSON.

147. ELECTROCHEMICAL PREPARATIONS. Theory and practice in the electrochemical preparation of organic and inorganic substances. Chemistry 11-12, 35-36. Two credits. DIETRICHSON.

155. WOOD CHEMISTRY. The course includes a general survey of the chemistry of the carbohydrate group, special attention being given to the

resins, the terpenes, cellulose and lignocellulose. Chemistry 35-36. Two credits. FRANKFORTER.

156. TECHNOLOGY OF PAPER PULP. Preparation of various wood products as pure cellulose. Commercial methods for preparation of wood pulp and manufacture of paper constitute a large part of work. Factory control of these processes is also given special attention. Chemistry 155. Two credits. TEMPLE.

161. CHEMICAL LITERATURE. The course aims to familiarize the students with chemical literature and will include required reading, reports, and bibliographical work. KRITCHEVSKY.

167-168. ADVANCED INORGANIC CHEMISTRY. Designed to systematize and broaden the student's knowledge of inorganic chemistry. Based largely on the Periodic System. Important types of chemical reactions are studied with reference to their analytical and industrial significance. Consists of lectures and recitations, supplemented by assigned reading. Two years of college chemistry. Four credits. BAKER.

169-170. CHEMISTRY OF THE RARE ELEMENTS. The descriptive chemistry of the rare elements and their analytical separation. Chemistry 11-12. Four credits. NICHOLSON.

171-172. SOLUTIONS. A systematic study of the phenomena and theories of solution, including the solution process, diffusion, osmosis, electrical properties, etc., with their various applications to other sciences. Chemistry 121-122, 123-124. Four credits. DERBY.

## COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. Research Work in Inorganic Chemistry. FRANKFORTER.

203-204. Research Work in Inorganic Chemistry. BAKER.

205-206. Research Work in Inorganic Chemistry. DIETRICHSON.

207-208. Research Work on the Rare Elements. NICHOLSON.

211-212. Research Work in Quantitative Analysis. SIDENER.

221-222. Research Work in Organic Chemistry. FRANKFORTER.

223-224. Research Work in Organic Chemistry. HUNTER.

225-226. Research Work in Organic Chemistry. KRITCHEVSKY.

227-228. Research Work on Oils and Varnishes. SCHUMANN.

231-232. Research Work in Physical Chemistry. DERBY.

233-234. Research Work in Physical Chemistry. STRACHAN.

235-236. Research Work in Physical Chemistry. MACDOUGALL.

241-242. Research Work on Foods. HARDING.

243-244. Research Work on Fuels. HARDING.

251-252. Research Work in Industrial Chemistry. TEMPLE.

253-254. Research Work in Applied Electrochemistry. DIETRICHSON.

255-256. Research Work in Photochemistry. STRACHAN.

## COMPARATIVE PHILOLOGY

Professor FREDERICK KLAEBER.

This department besides offering courses in the general principles of linguistic science, affords an opportunity for elementary studies in comparative Indo-European Philology, and more particularly the investigation of Old Germanic dialects. Related courses in English Philology will be found under English Language and Literature.

As a matter of course, candidates for the Master's degree must have a knowledge of Latin and German; candidates for the Doctor's degree must have a knowledge of Greek also.

Students are advised to confer with the department before selecting courses.

### NOTE ON THE GROUPING OF GRADUATE COURSES IN THE DEPARTMENTS OF COMPARATIVE PHILOLOGY, ENGLISH, GERMAN, AND SCANDINAVIAN

Candidates for the Master's degree in these departments are advised to choose at least three courses from one of the following groups:

GROUP I. GERMANIC PHILOLOGY—

Comparative Philology 101 (Science of Language), 102 (Life of Words), 106 (Advanced Science of Language), 108 (Comparative Phonology), 203-204 (Gothic), 207-208 (Old Saxon), 209-210 (Old High German).

English 201 (Anglo-Saxon), 204 (Beowulf).

German 107-108 (Middle High German), 109-110 (History of the German Language).

Scandinavian 201-202 (History of the Scandinavian Languages), 203-204 (Old Norse).

GROUP II. EARLIER GERMANIC LITERATURE—

Comparative Philology 207-208 (Old Saxon).

English 101 (Middle English), 103 (Piers the Plowman), 58 (Elizabethan Literature), 211-212 (Drama in England before Shakespeare), 204 (Beowulf).

German 107-108 (Middle High German).

Scandinavian 103 (Early Norwegian Literature), 107-108 (Swedish Literature), 203-204 (Advanced Old Norse).

GROUP III. LATER GERMANIC LITERATURE—

English 105, 107 (Eighteenth-Century Literature), 108 (Romantic Movement), 109-110 (English Humorists), 111, 112 (Seventeenth-Century Literature), 113-114 (Drama: Structure and Evolution), 123-124 (Meredith),

215-216 (Drama as a Form and Phase of Modern Thought), 225-226 (Political Prose of the Protectorate).

German 231-232 (Faust), 119-120 (Drama of Schiller), 127-128 (Lyric Poetry of the Eighteenth and Nineteenth Centuries).

Scandinavian 101-102 (Modern Norwegian Literature), 107-108 (Swedish Literature), 104 (Henrik Ibsen).
209-210 (Swedish Language and Literature), 109 (Strindberg).

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. General Introduction to the Science of Language. Prerequisite, one of following groups: (1) Five years foreign language, four may be in high school and one in college; (2) two years foreign language in college; (3) six credits Old English; (4) Courses 3 and 5 in English. Two credits. Klaeber.

102. Science of Language (Advanced Course). Investigation of linguistic problems. Study of standard works. Reports on recent publications. Prerequisites the same as those for Course 101. Alternates with Course 106. Not given in 1916-17. Two credits. Klaeber.

104. Introduction to Germanic Philology. Prerequisites the same as those for Course 101. A fair knowledge of German necessary. Not given in 1916-17. Two credits. Klaeber.

105. Universal Language. Comparison of families of languages grammatically and lexically. Movement for creation of an international language. Consideration of Volapük, Esperanto, Ido, etc. Prerequisites same as for Course 101. Two credits. Klaeber.

106. The Life of Words. Etymology and semasiology. Growth of vocabulary; change of words in form and meaning. Special reference to English and Germanic languages. Prerequisites same for Course 101. Alternates with Course 102. Two credits. Klaeber.

109-110. History of the German Language. Lectures, discussions, assigned readings. Prerequisites, German 53-54. This course is identical with German 109-110. Alternates with Course 141-142. Not given in 1916-17. Four credits. Klaeber.

141-142. Historical Grammar of the English Language. I. Sounds and Spelling. II. Accidence and Syntax. Alternates with Course 109-110. Four credits. Klaeber.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

202. Comparative Grammer of the Greek, Latin, and Germanic Languages. A general survey of the field of Indo-Germanic Philology will be included. Klaeber.

203-204. Gothic. The relation of Gothic to other Germanic dialects will be particularly emphasized. Study of the grammar (Braune, J.

Wright, Streitberg), reading of texts (Stamm-Heyne-Wrede's *Ulfilas,* or Streitberg's *Gotische Bibel*), discussion of problems. KLAEBER.

205. URGERMANISCHE GRAMMATIK. Lectures and study of standard works (Brugmann, Kluge, Noreen, Streitberg, *et al.*). KLAEBER.

206. COMPARATIVE PHONOLOGY OF ENGLISH AND GERMAN. Elements of phonetics; history of English and German sounds; orthography. Prerequisites same as for Course 101. Students must have completed German 3-4 (or 5-6) and 7-8. Alternates with Course 106. Two credits. KLAEBER.

207-208. OLD SAXON. Old Saxon grammar; interpretation of the *Heliand* and *Genesis.* KLAEBER.

209-210. OLD HIGH GERMAN. Braune's *Althochdeutsche Grammatik*; Braune's *Althochdeutsches Lesebuch.* This course is identical with German 105-106. KLAEBER.

211-212. RESEARCH SEMINAR. Competent graduate students will be advised and assisted in research along special lines. KLAEBER.

## DAIRY AND ANIMAL HUSBANDRY

Professor THEOPHILUS L. HAECKER; Assistant Professor THOMAS G. PATERSON.

*Prerequisite.* Twenty-two credit hours of work in the division.

Exemption from the language requirements for the Master's degree may be made in individual cases.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

106. ADVANCED MEATS AND JUDGING. Work along this line is a continuation of that begun in Course 9. More attention is given the more important details concerning meat, and a minute study of its physical and chemical composition is required. PATERSON.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. RESEARCH PROBLEMS IN ANIMAL NUTRITION. A study of the laws of animal nutrition with special reference to the relation of feed nutrients to animal growth and animal products. HAECKER.

## ECONOMICS

Professors JOHN H. GRAY, E. DANA DURAND; Assistant Professors ROY G. BLAKEY, J. FRANKLIN EBERSOLE, THOMAS WARNER MITCHELL; Instructors LLOYD M. CROSGRAVE, ROBERT J. MCFALL.

*Prerequisites.* For major work, twelve credits in Economics including the equivalent of Courses 3-4 (General Economics), and adequate train-

ing in the other social sciences for the particular work to be undertaken. For minor work, Economics 3-4 or the equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. THEORY AND PRACTICE OF STATISTICS. Principles of collection, tabulation, and interpretation of statistical material, illustrated by present-day statistical data. Lectures, assigned readings, and special investigations by individual members of the class. Six credits including Econ. 3. Three credits. DURAND.

103. DISTRIBUTION OF WEALTH. An advanced course in economic theory, devoted chiefly to a study of recent theories of distribution. Assigned readings, reports, and discussions.

104. HISTORY OF ECONOMIC IDEAS. History of economic thought; scope and logical methods, relation to other social sciences; methods of investigation and instruction. Assigned readings, reports, and class discussions. Econ. 3 and 4. Three credits.

131. COST ACCOUNTING. Analysis of production cost; methods of recording materials, labor, and machine costs; apportioning indirect expenses; relation of cost to general accounts; use of cost data to enforce operating efficiency. Laboratory lectures. Econ. 3 and 35-36. Three credits. MITCHELL.

132. ACCOUNTING PROBLEMS. A selection from C. P. A. examinations and other sources of difficult problems that confront the public accountant. Econ. 3 and 35-36. Three credits. (Not given in 1916-17.) MITCHELL.

133. ACCOUNTING SYSTEMS. The special accounting problems of building societies, banks, department stores, insurance companies, railroad companies and other types with a description of their accounting systems. Econ. 35-36, and 131 or 132. Three credits. (Not given in 1916-17.) MITCHELL.

134. AUDITING. Preparation for, and conduct of, an audit; the auditor's report and certification, and legal responsibilities. Textbook, assigned readings, class discussions, and lectures. Econ. 35-36, and 131 or 132. Three credits. (Not given in 1916-17.) MITCHELL.

139. BANK ADMINISTRATION. The modern commercial bank from the manager's point of view. Legal problems, department functions, profit-making methods, credits, adjustment of bank policy to prospective business conditions. Lectures, and laboratory work in local banks. Econ. 3 and 43, and consent of instructor. Three credits. EBERSOLE.

142. INVESTMENT AND SPECULATION. The social process of saving and investment; government, municipal, corporation, and real estate loans; stock exchange operations and money market influences as they affect

the prices and net yield of prime securities. Econ. 3 and 43 or 143. Three credits. EBERSOLE.

143. MONEY AND PRICES. The functions of money; the nature and effects of credit; changes in general prices, their causes and effects; international movements of gold; monetary standards and currency systems; the problem of securing an ideal money. Econ. 3 and 42 or 43. Three credits. EBERSOLE.

144. PANICS, COMMERCIAL CRISES, AND CYCLES OF TRADE. American business conditions since 1890 with regard to the great cycles of alternate prosperity and depression, the financial panics. Critical examination of all the available business barometers designed to forecast similar conditions. Econ. 3 and 43 or 143. Three credits. EBERSOLE.

145. THE MODERN BUSINESS CORPORATION. The organizing, financing, and managing of corporations; the position of the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. Six credits including Econ. 3. Three credits. GRAY.

146. PUBLIC UTILITIES. Economic and legal bases of classification, the relative advantages of public ownership and regulation. Central and municipal regulation compared. The basis of rates; relative rates; rates and service. Different theories of valuation. Econ. 145. Three credits. GRAY.

161. LABOR PROBLEMS. Modern labor problems: woman and child labor, industrial education, unemployment, poverty, industrial hygiene, welfare work, profit sharing, coöperation, labor unions, strikes, boycotts, conciliation, and arbitration; economic causes and effects of immigration. Econ. 3 and 4. Three credits. CROSGRAVE.

163. ECONOMIC CONDITIONS IN AMERICAN CITIES. The causes of economic dependence in American cities; the standard of living; the constructive agencies for economic betterment. Lectures, assigned readings, and visits of inspection in the Twin Cities. Six credits including Econ. 3. Three credits. (Not given in 1916-17.) CROSGRAVE.

164. THE ECONOMIC FUNCTIONS OF THE STATE. The proper limits of state interference with private property, freedom of contract and individual liberty. Police powers of the state. Legislation concerning factories, female and child labor, minimum wage, social insurance, etc. Six credits including Econ. 3. Three credits. CROSGRAVE.

165. HISTORY AND THEORY OF SOCIALISM. Economic utopias from Plato to Proudhon. Special attention to the theory, history, and practical significance of modern socialism. Lectures, assigned readings, and discussions. Six credits including Econ. 3. Three credits. CROSGRAVE.

166. TRADE UNIONISM AND ALLIED PROBLEMS. Development and present activities of American trade unions. Economic and legal aspects of collective bargaining, closed shops, strikes, boycotts, employers' asso-

ciations. Conciliation and arbitration. Social significance and probable future of trade unionism. Six credits including Econ. 3. Three credits. CROSGRAVE.

168. WAGES. The history of real and money wages during the last four centuries. Theories of wages from Adam Smith to the present. Wage statistics. Wage regulation with intensive study of minimum wage laws. Econ. 164 or 166 and consent of instructor. Three credits. (Not given in 1916-17.) CROSGRAVE.

173. RAILWAY PROBLEMS. Survey of railways and railway policy of the United States and representative foreign countries; canal and ocean transportation; railway organization and finance; railway discriminations. competition, pooling and combination; the railways and labor. MCFALL.

174. RAILWAY RATE REGULATION. Rate-making in practice; Federal and State legislation; cost and value of service in rate-regulation; railway earnings and valuation; regulation of rate-schedules and particular rates; classification; representative opinions of the Interstate Commerce Commission; Minnesota rate-regulation. MCFALL.

*191. PUBLIC FINANCE. Public expenditures; public debt; budgetary legislation; tax systems. BLAKEY.

*192. STATE AND LOCAL TAXATION. Problems of state and local taxation. Historic survey of various taxes and examination of present procedure in taxing different kinds of property; tax reforms. Particular attention given to conditions in Minnesota. BLAKEY.

## COURSES PRIMARILY FOR GRADUATE STUDENTS

251-252. SEMINAR IN AGRICULTURAL ECONOMICS. Research problems in the marketing and distribution of farm products, agricultural credit, farm ownership and tenancy, and agricultural organizations. Econ. 3, 17, and six other credits in Economics or Farm Management. Six credits. DURAND.

253-254. SEMINAR IN ACCOUNTING. Student reports and theses dealing with accounting systems, published reports, and interpretations of the accounts of business establishments located in or near the Twin Cities. Twelve credits including Econ. 35-36, and 131. Six credits. (Not given in 1916-17.) MITCHELL.

255-256. SEMINAR IN MONEY AND BANKING. The various unsettled monetary and banking problems of the United States will furnish topics for individual investigation. Twelve credits including Econ. 43. Six credits. EBERSOLE.

257-258. SEMINAR IN ECONOMIC DEVELOPMENT AND TAXATION. Original investigation of various industries in the Middle West. The development of tax systems. Present problems in taxation. Twelve credits prerequisite. Six credits. (Not given in 1916-17.)

259-260. SEMINAR IN CORPORATION AND TRUST PROBLEMS. Practical and independent investigation by each student, under the guidance of the instructor, of some specific problem pertaining to corporations, trusts, and other monopolies. Twelve credits prerequisite. Six credits. GRAY.

## ECONOMIC ZOOLOGY

Professor FREDERICK L. WASHBURN; Associate Professor ARTHUR G. RUGGLES; Assistant Professors CHARLES W. HOWARD, WILLIAM MOORE.

*Prerequisites.* Eighteen credits in Economic Zoology and Animal Biology.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

104. METHODS IN ECONOMIC ENTOMOLOGY. Methods of breeding insects; identification of insects in various stages; photography of insects; general field work, etc. Economic Zoology 3. Three credits. MOORE.

105-106. SPECIAL PROBLEMS. Investigations of special problems for those intending to specialize in entomology or economic zoology. Problems may be chosen in any section of the Division. Those taking the course are expected to be in attendance during the Summer Session. Economic Zoology 104. Six credits. WASHBURN, RUGGLES, HOWARD, MOORE.

107-108. IMMATURE STAGES OF INSECTS. A study of immature forms of economic insects. Laboratory work. Economic Zoology 3. Three or six credits. RUGGLES.

109-110. ACTION OF INSECTICIDES. A study of the common insecticides and their action on insects and their hosts. Laboratory and conference work. Economic Zoology 3. Three or six credits. MOORE.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

203-204. RESEARCH IN ECONOMIC VERTEBRATE ZOOLOGY. Problems in life history, food habits, etc., of birds and mammals of economic interest to agriculture and horticulture. Study of control measures of injurious species. Twelve credits in Economic Zoology and Animal Biology. Six to fifteen credits. WASHBURN.

205-206. RESEARCH IN ECONOMIC ENTOMOLOGY. Problems relating to insects attacking trees or crops. Economic Zoology 12. Six to fifteen credits. RUGGLES.

207-208. RESEARCH IN PARASITOLOGY AND MEDICAL ENTOMOLOGY. Problems in parasites of man and domestic animals; medical entomology. Twelve credits in Economic Zoology and Animal Biology. Six to fifteen credits. HOWARD.

209-210. RESEARCH IN INSECTICIDES. Problems relating to the action and uses of various insecticides on insects and their hosts. Economic Zoology 109-110, and six credits more in Economic Zoology and Animal Biology. Six to fifteen credits. MOORE.

## EDUCATION

Professors LOTUS D. COFFMAN, MELVIN E. HAGGERTY, ALBERT W. RANKIN, FLETCHER H. SWIFT.

*Prerequisites.* For major work, at least a year's work in psychology and in addition to this a total of not less than two years of undergraduate work in Education.

Exemption from the language requirement for the Master's degree may be made in individual cases.

### DEPARTMENTAL CONFERENCES

Every alternate Monday all graduate students majoring in Education are expected to meet with the departmental staff from 7:15 to 9 p.m. for conference regarding subjects of original investigation. This work carries no credit.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

*Note*: Candidates for the University State Teachers' Certificate may offer Courses 101-102 in place of Education 3.

101. FOUNDATIONS OF MODERN EDUCATION. An interpretative historical study of those elements in modern education derived from the Hebrews, Greeks, Romans, Middle Ages, and Renaissance. Emphasis will be laid upon secondary and higher education and the origin and results of the monopoly of the cultural conception of education and cultural studies. Phil. 1-2 and six credits in Hist. Three credits. SWIFT.

102. HISTORY OF EDUCATION FROM THE REFORMATION TO THE PRESENT TIME. Modern educational institutions, theories, and problems in the light of their history. Special emphasis upon elementary education. Phil. 1-2 and six credits in Hist. Three credits. SWIFT.

103. EDUCATIONAL CLASSICS. An intensive study of selected writings of educational leaders, ancient, medieval, and renaissance. Education 1 or 101. Three credits. SWIFT.

104. EDUCATIONAL CLASSICS. An intensive study of selected writings of educational leaders from Locke to the present. Education 1 or 101-102. Three credits. SWIFT.

105. EDUCATIONAL PSYCHOLOGY. Advanced work in genetic psychology, the origin and nature of the human organism, the origin, development and control of instincts, and the relation of instincts to the formation

of habits, introductory to the psychology of learning. Phil. 1-2. Three credits. HAGGERTY.

106. EDUCATIONAL PSYCHOLOGY. The psychology of learning. Methods of measuring the rate of learning; study of typical learning experiments and an examination of the conditions of the most economic learning, study of individual differences, and the psychology of the school subjects. Philosophy 1-2. Three credits. HAGGERTY.

109. EDUCATIONAL DIAGNOSIS. A study of educational scales and standard tests for the measurement of efficiency in school subjects. The course will deal with the nature of the tests, the methods of their use and an analysis of results obtained. Education 1 or 101-102 and 3. Two credits. HAGGERTY.

119. SCHOOL CURRICULA. The curriculum as related to social, industrial and economic conditions; a survey of the grammar grades and of the high school. Consideration of the possibilities of developing a curriculum better adapted to community needs. Education 1 or 101-102 and 3. Three credits. RANKIN.

121a,b. SCHOOL ORGANIZATION AND ADMINISTRATION. An introductory course in school administration for students of teaching experience and for those looking forward to work as principals and superintendents. Education 1 or 101-102 and 3. Three credits. RANKIN.

123. THEORY OF SUPERVISION. The problems involved in the training of teachers in service; studies of qualities of merit in teachers; factors in selecting teachers; the distribution of subject matter by grades; the time allotment of studies. Education 1 or 101-102 and 3. Three credits. COFFMAN.

124. EDUCATIONAL ADMINISTRATION. The interpretation of present tendencies in the administration of state and city school systems. Education 121. Three credits. COFFMAN.

125. METHODS IN EDUCATIONAL RESEARCH. A study of statistical and other methods as applied to educational investigation. This course is ordinarily required of all candidates for advanced degrees. Education 1 or 101-102 and 3. Two credits. COFFMAN.

131. GERMAN SCHOOLS. A study of the existing school systems of Germany with emphasis upon present conditions and problems. Education 1 or 101-102 and 3. Three credits. SWIFT.

132. FRENCH SCHOOLS. A study of the existing school systems of France with emphasis upon present conditions and problems. Education 1 or 101-102 and 3. Three credits. SWIFT.

134. MENTAL DIAGNOSIS OF SCHOOL CHILDREN. A study of mental variations in children, its nature, degree, causes and effects, and a discussion of methods of treating superior and subnormal individuals in the schools. Philosophy 1-2. Two credits. HAGGERTY.

136. MENTAL TESTS. A study of individual differences by means of mental tests. Laboratory work in giving and taking tests introductory to the use of group tests for the measurement of age-level, etc. Philosophy 1-2. Three credits. HAGGERTY.

141. SCHOOL SANITATION AND PUBLIC HEALTH. A course in school hygiene in its broader aspects. Designed for all teachers and supervisors who are responsible for the health of school children. Treats of medical supervision and other problems arising from school environment. Education 1 or 101-102 and 3. Three credits. RANKIN.

142. INDUSTRIAL EDUCATION. Existing types of industrial and vocational schools and systems of training. Comparison of conditions in American and foreign countries. Organization of course of study. Education 1 or 101-102 and 3. Three credits. RANKIN.

146. HISTORY AND PRINCIPLES OF RELIGIOUS EDUCATION. Part I: The influence of religion and religious education as social and spiritual forces among certain selected types. Part II: Principles of education as applied to religious instruction and training. This course may be pursued as a graduate course under certain conditions. Philosophy 1-2. Three credits. SWIFT.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. SEMINAR IN SELECTED PROBLEMS IN EDUCATIONAL HISTORY. Research work for graduate students. Education 101-102 and six credits in History. Two credits. SWIFT.

203-204. SEMINAR IN EDUCATIONAL PSYCHOLOGY. A research course for graduate students. Problems in educational psychology. Education 105. Two credits. HAGGERTY.

205-206. SEMINAR IN EDUCATIONAL ADMINISTRATION. Education 124, 125, 126. Two credits. COFFMAN.

## ELECTRICAL ENGINEERING

Professors GEORGE D. SHEPARDSON, FRANK W. SPRINGER; Assistant Professor WILLIAM T. RYAN; Instructors HUBERT M. TURNER, ERNEST A. REID.

*Prerequisites.* For major work, twelve credits in the department. For minor work, six credits in Physics.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101-102. ELECTRICAL MACHINERY. Electrical engineering measuring instruments and their use; units; theory of dynamo-electric machinery; methods of regulation; construction and operation of generators and motors; methods of testing. One year of Physics. Three credits. SPRINGER, TURNER.

103-104. ELECTRICAL LABORATORY. To be taken with Course 101-102. Electrical engineering measurements, calibration of instruments, operation and characteristic curves of generator and motor. Lectures and practice. Physics 12-13. Two credits. TURNER, REID.

105-106. ALTERNATING CURRENTS. Phenomena, measurement, and use of alternating currents; theory of line, transformer, generator, and motor; types of apparatus. Electrical Engineering 101-102 and 103-104. Three credits. SHEPARDSON.

107-108. ELECTRICAL LABORATORY. To be taken with Course 105-106. Experimental study of alternating currents, regulation and efficiency tests of alternators, transformers, motors, and rotaries. Electrical Engineering 101-104. Three credits. SPRINGER.

111. ELECTRIC LIGHTING. Principles of vision; photometers and measurement of light; methods and calculations of illumination; various sources of light; development of electric illuminations; distribution systems. Lectures, problems, and laboratory practice. One year of Physics. Two credits. SHEPARDSON.

115-116. JOURNAL READING. Weekly discussion of current electrical periodicals. SHEPARDSON.

117-118. ELECTRICAL DESIGN. The design of direct and alternating generators and motors, and alternating current transformers; complete working drawings and specifications to accompany each design. Electrical Engineering 101-102 and 105. RYAN.

## COURSES PRIMARILY FOR GRADUATE STUDENTS

205. CENTRAL STATIONS. Lectures, recitations, and assigned problems and readings, treating of the operation, design, and construction of electric power generating stations. Electrical Engineering 101-102 and 105-106. Two credits. RYAN.

206. ELECTRICAL TRANSMISSION. Considerations involved in the selection of conductors in actual practice; Kelvin's law and its limitations; the transmission line as a mechanical structure; lighting arresters; study of particular high-tension lines. Electrical Engineering 205. Two credits. RYAN.

213-214. TRANSIENT ELECTRIC PHENOMENA. Transient phenomena accompanying a change of circuit conditions, with their differential equations; abnormal currents, voltages, and frequencies produced by switching, short circuits, and arcing grounds. Distributed capacity and inductance, standing waves, traveling waves, phenomena at transition points of complex circuits, power and energy of complex circuits. Electrical Engineering 105-106. Two credits. TURNER.

215-216. RADIO-SIGNALING. Maxwell's electromagnetic theory, experimental work of Hertz, phenomena of electric oscillations in simple and

coupled circuits, generation and reception of damped- and undamped-waves, propagation of electromagnetic waves through space, effect of curvature of the earth, absorption by obstacles, attenuation with distance, measuring instruments, types of antennae. Lecture and laboratory. Electrical Engineering 105-106. Two credits. TURNER.

219. TELEGRAPH AND TELEPHONE APPARATUS. Theoretical and experimental study of apparatus used for signaling, telegraphy, and telephony. Lectures and laboratory. Electrical Engineering 105-106. Two credits. SHEPARDSON.

220. TELEGRAPH AND TELEPHONE CIRCUITS. Theoretical and experimental study of telephone circuits and the phenomena of telephonic transmission; applications of hyperbolic functions to line phenomena. SHEPARDSON.

221-222. PRECISE ELECTRICAL ENGINEERING MEASUREMENTS. Lectures and laboratory work. Precise measurements of resistance, voltage, current, self-induction, and capacity; standardization of measuring instruments. Open to a limited number subject to approval. Electrical Engineering 107, 111 and 105-106. One credit. SPRINGER.

226. ILLUMINATING ENGINEERING. Lectures and laboratory work. Investigation of performance of electric and gas lamps, reflectors and diffusers; luminous efficiency, distribution, color characteristics, physiological phenomena; methods of determining location, kind, and quality of lights for obtaining desired illumination. Electrical Engineering 111. Two credits. SHEPARDSON.

229-230. ELECTRICAL LABORATORY. Efficiency tests and special problems. Electrical Engineering 103-104. SHEPARDSON, SPRINGER, TURNER. 102, 105-106, and 117. RYAN.

232. ELECTRICAL DESIGN. Special problems. Electrical Engineering 101-102, 105-106, and 117. RYAN.

## ENGLISH

Professors RICHARD BURTON, HARDIN CRAIG, FREDERICK KLAEBER, ELMER E. STOLL,* CARLETON BROWN; Associate Professor OSCAR W. FIRKINS; Assistant Professors JOSEPH W. BEACH, GEORGE N. NORTHROP.

*Prerequisites.* For major work, not less than eighteen credit hours in the subject, including satisfactory introductory courses in Old English and Shakespeare and a course dealing with some major figure in the field of English literature; namely, Beowulf, Chaucer, Spenser, Milton, Dryden, Pope, Wordsworth, Byron, Browning, Tennyson, according to the period in which graduate work is to be undertaken.

For minor work, not less than eighteen credit hours in the subject.

* Absent on leave.

In cases where the nature of the work to be undertaken by candidates for the Master's degree warrants it, another foreign language may be substituted for French or German.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. INTRODUCTION TO MIDDLE ENGLISH. An outline of Middle English grammar, including the interpretation of selected texts. Alternates with Course 103. Not offered in 1916-17. Twice a week, one hour. English 1-2 and 3, or 3 and 4. Two credits. KLAEBER.

103. PIERS THE PLOWMAN. A critical study of *Piers the Plowman*. Alternates with Course 101. Twice a week, one hour. English 1-2 and 3, or 3 and 4. Two credits. KLAEBER.

105. EIGHTEENTH-CENTURY POETRY. Rise of Naturalism and Romanticism. Eighteenth-century English poetry from Pope to Burns, with special reference to the rise and growth of naturalism and romanticism. Three times a week, one hour. English 1-2. Three credits. CRAIG.

107. EIGHTEENTH-CENTURY PROSE. Lectures on eighteenth century prose and prose writers with readings by the students and essays on approved topics; special study of fiction and the essay. Three times a week, one hour. Not offered in 1916-17. English 1-2. Three credits. CRAIG.

108. THE ROMANTIC MOVEMENT. The Romantic School of poets from Wordsworth to Keats and the influence of the revolution in France. Three times a week, one hour. English 1-2. Three credits. CRAIG.

109-110. ENGLISH HUMORISTS. Comic spirit in modern literature; humor, wit, comedy, and satire, with reference to their use in criticism of life. Illustrations from dramatists, novelists, essayists, and poets. Not offered in 1916-17. Three times a week, one hour. English 1-2. Six credits. BEACH.

111-112. SEVENTEENTH-CENTURY PROSE. First semester; general survey of prose of century to 1660. Second semester: literature of the Restoration, particularly Dryden. Course 3-4 in History a desirable prerequisite. Three times a week, one hour. English 1-2. Six credits. NORTHROP.

113-114. THE DRAMA: STRUCTURE AND EVOLUTION. First semester: theory of the drama, and history up to the nineteenth century. Second semester: recent drama, continental, English. Open only to those who have completed the first semester. Three times a week, one hour. Twelve credits prerequistie. Six credits. FIRKINS.

115. ENGLISH IDIOM. A discussion of current idiom with the purpose of relating it to underlying principles of historic development. Twice a week, one hour. English 1-2. Two credits. BURTON.

118. THE BIBLE AS LITERATURE. A literary study of the Old Testament with special attention to forms and the critical study of selected read-

ings. Three times a week, one hour. Not offered in 1916-17. English 1-2. Three credits. BURTON.

119-120. PRINCIPLES OF LITERARY CRITICISM. Elements in literature, e.g., clearness, vigor, beauty, etc.; exposition of literary types, e.g., the lyric, epic, short story, etc., in relation to standards of judging. Before registering, consult instructor. Three times a week, one hour. English 1-2. Six credits. FIRKINS.

122. AMERICAN LITERATURE. Lectures on American literature, with extensive readings from the principal poets and prose writers of this country. Three times a week, one hour. Not offered in 1916-17. English 1-2. Three credits. CRAIG.

123-124. SEMINAR IN NOVELISTS. George Meredith. Credit may be given on completion of one semester. Open upon approval of instructor to graduate students and seniors having twelve credits in English. Once a week, two hours. Four credits. BEACH.

125-126. BIOGRAPHY. Development of English biography, attention to notable journals, etc. Open to graduate students having undergraduate major in English or history. Upon approval of instructor, to seniors with twelve credits in English. Once a week, two hours. Four credits. NORTHROP.

128. SEVENTEENTH-CENTURY DRAMA. The drama from the Restoration to the rise of sentimental comedy, special attention being given to the Comedy of Manners, from Etherage to Farquhar. Three times a week, one hour. English 55 or 131. Three credits. Not offered in 1916-17. STOLL.

131. ELIZABETHAN DRAMA. A study of Elizabethan and Jacobean dramatists (Shakespeare not included) from Lyly to Shirley. Three times a week, one hour. English 55. Three credits. Not offered in 1916-17. STOLL.

133. THE ENGLISH AND SCOTTISH POPULAR BALLADS. The study of a large number of traditional ballads, English and foreign, and the study of ballad style and origins. Twice a week, one hour. English 1-2. Three credits. BROWN.

136. THE LATER PLAYS OF SHAKESPEARE. Intensive classroom analysis of four plays. Comprehensive collateral reading of other plays. Three times a week, one hour. Not offered in 1916-17. English 55. Three credits. NORTHROP.

138. HISTORY OF CRITICISM. This course traces the rise, growth, and present status of the principles of criticism as applied to literature. Twice a week, one hour. BURTON.

140. ADVANCED STUDY OF CHAUCER. Further study of *The Canterbury Tales* and of the Minor Poems. Open upon approval of instructor to juniors, seniors, and graduates who have completed 5a or 5b. Twice a week, one hour. BROWN.

PRIMARILY FOR GRADUATE STUDENTS

201. ANGLO-SAXON. Comparative study of Anglo-Saxon (Old English) grammar and reading of prose texts. Once a week, two hours. KLAEBER.

204. BEOWULF. Critical reading of the poem of *Beowulf*. Once a week, two hours. KLAEBER.

211-212. THE DRAMA IN ENGLAND, BEFORE SHAKESPEARE. The various forms of the early drama; sources and texts of medieval plays, medieval players, the stage, and the function of the early drama. Once a week, two hours. CRAIG.

215-216. THE DRAMA, AS A FORM AND PHASE OF MODERN THOUGHT. A study of the dramas of Bernard Shaw. Once a week, two hours. BURTON.

221-222. THE DRAMA IN THE RENAISSANCE. An investigation of the more important dramatic species and character types in England and on the Continent, so far as represented in the Elizabethan age. Once a week, two hours. Not offered in 1916-17. STOLL.

225-226. POLITICAL PROSE OF THE PROTECTORATE. Intensive study of Clarendon and of the letters of this period. Not offered in 1916-17. Once a week, two hours. NORTHROP.

## EXPERIMENTAL ENGINEERING

Professor WILLIAM H. KAVANAUGH; Associate Professor ADOLPH F. MEYER; Assistant Professors CHARLES F. SHOOP, FRANKLIN R. MCMILLAN.

*Prerequisites.* For major work, twelve credits; for minor work, six credits in the department.

COURSES FOR GRADUATES AND UNDERGRADUATES

101. MATERIALS TESTING LABORATORY. Investigation of strength and physical properties of various metals and engineering materials, including wood, cement, concrete, ropes, cables, belting, and chains. Supplemented by lectures on the various materials of construction and standard methods of testing. Engineering Mathematics 151 or with Engineering Mathematics 151. Two credits. KAVANAUGH, SHOOP, MCMILLAN.

102. HYDRAULIC AND STEAM LABORATORY. Hydraulic measurements. Calibration of weirs, nozzles, orifices, and meters. Tests of water motors, rams; pulsometers; valve setting, indicator practice, calorimetry, study of lubricants, and introductory steam experiments. Engineering Mathematics 152 or with Engineering Mathematics 152. Two credits. KAVANAUGH, SHOOP, MCMILLAN.

103. STEAM AND POWER LABORATORY. Calibration of dynamometers and measurement of power. Tests of injectors, ejectors, steam and power pumps, steam turbines, steam engines, and boilers. Mechanical Engineering 130 or with Mechanical Engineering 130. Four credits. KAVANAUGH.

104. ADVANCED POWER AND GAS ENGINE LABORATORY. Continuation of Course 103. Tests of complete power and lighting plants. Tests of gas, gasoline, and hot air engines, gas producers, air compressors. Automobile and locomotive testing. Experimental Engineering 103. Three credits. KAVANAUGH.

108. ADVANCED HYDRAULIC LABORATORY. Consisting of experimental and demonstration work with centrifugal pumps, reaction turbines, impulse wheels, and spillways. Experimental Engineering 102. One credit. MEYER.

113. CONCRETE LABORATORY. Aggregates, proportioning, field and laboratory methods of determining choice of materials and mixtures. Tests of plain and reinforced concrete members to determine quality of materials. Experimental Engineering 101. Three credits. McMILLAN.

114. STRUCTURAL AND CONCRETE LABORATORY. Tests of structural elements of steel and reinforced concrete. Beams, columns, joints, and frame structures. Building and bridge tests. Experimental Engineering 101. Three credits. McMILLAN.

### PRIMARILY FOR GRADUATE STUDENTS

116. EXPERIMENTAL LABORATORY. Special research work and commercial tests. Experimental Engineering 103 or 113. Three credits. KAVANAUGH, SHOOP, McMILLAN.

118. ADVANCED HYDRAULIC LABORATORY. Continuation of Course 108. Study of special hydraulic problems in the field and laboratory. Experimental Engineering 108 and with Civil Engineering 124. Three credits. MEYER.

## FARM MANAGEMENT

See Agronomy and Farm Management.

## FORESTRY

Professors EDWARD G. CHEYNEY, JOHN ALLISON; Associate Professor JOHN P. WENTLING; Assistant Professor WILLIAM H. KENETY.

*Prerequisites.* For major work, Botany 1, 2, and twelve credits in Forestry. For minor work, six credits in the department.

The choice of subject must be made by the candidate and approved by the director and instructor. The laboratories of the Botany Depart-

ment and the facilities of the Forest Experiment Stations at Cloquet and Itasca are available to students taking this work.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. ADVANCED DENDROLOGY. A continuation of Courses 2 and 5 with special studies in classification and distribution. Six credits in Botany and five credits in Dendrology. Three credits. WENTLING.

102. RESEARCH METHODS IN SYLVICULTURE. A study of fundamental principles of sylviculture which are broadly applicable, as well as methods used at Forest Experiment Stations in solving problems in forestation, management, protection, and mensuration. Dendrology 2, 5, 34, and Botany 9. Two credits. KENETY.

103. USES OF WOOD. A thoro study of the woods used by the various wood-using industries. Woods for special uses, fancy woods, cabinet woods, wood substitutes. Dendrology 5. Three credits. CHEYNEY, WENTLING.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. RESEARCH PROBLEMS IN THE SCIENCE AND PRACTICE OF SYLVICULTURE. WENTLING.

203-204. RESEARCH PROBLEMS IN MANAGEMENT AND WORKING PLANS. ALLISON.

205-206. LUMBER MARKETS AND PRICES. A careful study of the regions of production and the centers of distribution of different kinds and grades of lumber, together with the prices of the same in the various markets. CHEYEY.

## GEOLOGY AND MINERALOGY

Professor WILLIAM H. EMMONS; Associate Professor CLINTON R. STAUFFER; Assistant Professors FRANK F. GROUT, CHESSLEY J. POSEY; Instructors A. WALFRED JOHNSTON, TERENCE T. QUIRKE.

*Prerequisites.* For major work in:

General Geology and Economic Geology—

Courses 1, 6, 21, 22; a knowledge of general chemistry. 105 must be carried along with other graduate work.

Petrology, 1, 6, 21, 22—

Elementary chemistry and physics.

Paleontology, 1, 6, 57, 58, or 1, 6, 11, 12—

Animal biology is a desirable antecedent.

Geography, 1, 6, 29, 36, or 1, 2, 21, 32.

For minor work, Geology 1 and 6 or their equivalent.

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 other graduate

work. Examinations in French and German are required of candidates for service on the United States Geological Survey.

105. ELEMENTS OF ROCK STUDY. Occurrence and genesis of igneous, sedimentary, metamorphic rocks; their composition, structure, texture, and alteration. Classification, methods of identification and description of rocks. Open to students who have had Course 1 and are taking Course 22. Three credits. GROUT.

106. PETROLOGY. 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. Laboratory work, lectures, and reference reading. Open to students who have had elementary mineralogy and Course 105 or its equivalent. Three credits. GROUT.

108. PALEONTOLOGIC PRACTICE. The collection, preparation, and study of materials with a view to gaining a working knowledge of groups of fossils. Open to students who have taken or are taking Course 57. Three credits. STAUFFER.

109. PALEONTOLOGIC GEOLOGY. The Ordovician fauna with special emphasis on the Ordovician of Minnesota and neighboring states. Three credits. STAUFFER.

110. PALEONTOLOGIC GEOLOGY. A continuation of Course 109. Three credits. STAUFFER.

111. ORE DEPOSITS. The nature, distribution, and genesis of ore deposits of the United States; relations of ore deposits to geological structure; the deformation and superficial alteration of ore deposits. General Geology, Petrology, and Mineralogy. Four credits. EMMONS.

112. PROBLEMS IN ORE DEPOSITS. Field excursions, map work, lectures on field and laboratory methods. Geology 111. Four credits. EMMONS.

116. GEOGRAPHY OF LATIN AMERICA. The regional geography of the Latin-American countries; their geology, topography, climate, natural resources, people, industries, and trade. The trade relations between Latin-American countries and the United States given special attention. Alternates with Course 118. Geology 1, 29 or 31, 32 and three credits in Geography. Three credits. POSEY.

118. GEOGRAPHY OF EURASIA. Regional geography of Eurasia; its geology, topography, climate, natural resources, people, industries, and trade. Attention to attitude of the major European countries to the "new" lands of Asia. Alternates with Course 116. Similar prerequisites. Three credits. POSEY.

124. STRUCTURAL AND METAMORPHIC GEOLOGY. The conditions, processes, and results of metamorphism; structural features resulting from deformation under varying conditions of load. Geology 6, 22, 105. Three credits. JOHNSTON.

131-132. ADVANCED PETROLOGY. Advanced optical methods. Criteria for rapid identification of minerals and rocks. The uses of schedules and tables. Standard rock types. Regional and genetic studies. Petrographic reports. Geology 106. Six credits. GROUT.

137. TESTING ECONOMIC MINERALS. Methods of determining quality of mineral deposits, described and illustrated by laboratory tests of coals, oil, building stone, and metallic ores. Offered in 1916-17. Geology 6, 22, 105. Three credits. GROUT.

140. APPLIED PETROLOGY. To follow or accompany Course 132. Determination of transparent and opaque ores and gangue minerals. Microscopic studies of paragenesis of ores and other mineral associations by means of reflected light. Practical petrographic problems. Credits to be arranged. GROUT.

144. CONSTRUCTION OF GEOLOGIC MAPS. Methods of geological examination; problems in construction and interpretation of geologic maps and sections, with special reference to underground mapping of metalliferous areas; field practice in plane table methods of topographic and geologic mapping. Geology 1, 6. Three credits. QUIRKE.

151. ADVANCED GENERAL GEOLOGY. Geologic processes and their results; development of the North American continent. Geology 6. Three credits. STAUFFER.

152. ADVANCED GENERAL GEOLOGY. A continuation of Course 151. Three credits. STAUFFER.

160. FIELD GEOLOGY. Two weeks in the field in the summer vacation period. Fields for 1917, the Mesabi and Vermilion ranges. Credit given only on completion of a satisfactory report. Geology 1. Three credits. JOHNSTON.

PRIMARILY FOR GRADUATE STUDENTS

211. ADVANCED PALEONTOLOGY. Selected groups of fossils. Class work supplemented by reference readings and thesis. Three credits. STAUFFER.

214. SEMINAR IN ORE DEPOSITS. Three credits. EMMONS.

220. GLACIAL GEOLOGY. Hours to be arranged. 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. Not offered in 1916-17.

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 direction of instructor. As far as practicable, methods follow standards of Federal and State Surveys. EMMONS, 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. Not offered in 1916-17. JOHNSTON.

247. GEOLOGY AND EXPLORATION OF LAKE SUPERIOR REGION. The geology of the Lake Superior iron districts. The methods used in the exploration of iron ore; interpretation of drill cores; cartographic expression of drill data; models of drilled areas. The principles of magnetic surveying. Three credits. JOHNSTON.

251-252. ORIGINAL PROBLEMS. Morphology and physical measurements of minerals. Hours to be arranged. Three credits each. GROUT.

253-254. RESEARCH COURSE IN ORE DEPOSITS. Advanced work in ore deposits; chiefly individual work on selected subjects. Collections of material gathered in field work studied under direction of instructor. As far as practicable, methods follow standards of Federal and State Surveys. Three credits each. EMMONS, GROUT.

263-264. RESEARCH COURSE IN PETROLOGY. Advanced work in petrology; individual work on selected subjects. Collections of material gathered in course of field work studied under direction of instructor. As far as practicable, methods follow standards of Federal and State Surveys. Three credits each. EMMONS, GROUT.

289-290. RESEARCH COURSE IN GEOGRAPHY. Students will be required to do semi-independent work on selected subjects. Three credits. POSEY.

## GERMAN

Professor CARL SCHLENKER; Assistant Professors OSCAR C. BURKHARD, WALTER R. MYERS; Instructors JAMES DAVIES, J. THEODORE GEISSENDOERFER, ARTHUR R. GRAVES, THEOPHILUS H. SCHROEDEL.

*Prerequisites.* For major work, twenty-four credits, not including Course 1-2. For minor work, eighteen credits, not including Course 1-2. For courses in Germanic Philology see the statement of the Department of Comparative Philology.

107-108. BEGINNING MIDDLE HIGH GERMAN. Phonology, accidence, the syntax of Middle High German with reference to New High German. *Der arme Heinrich, Nibelungenlied,* selected poems of Walther. Lectures on the epic and on German life in 12th and 13th centuries. Four credits in starred courses. Four credits. SCHLENKER, SCHROEDEL.

109-110. HISTORY OF THE GERMAN LANGUAGE. Its development, with special reference to modern German. Based on Behagel's *Deutsche*

*Sprache,* Etymology, word formation, syntax, comparison of English and German, etc. Four credits in starred courses. Four credits. Not given in 1916-17. KLAEBER.

119-120. THE DRAMA OF SCHILLER. Plays considered with reference to development of the dramatic idea, from expression of the Storm and Stress movement in the early plays to the classic form of the last works. Four credits in starred courses. Four credits. MYERS.

127-128. LYRIC POETRY OF THE EIGHTEENTH AND NINETEENTH CENTURIES. Historical review of the best lyric poetry and the chief writers. Four credits in starred courses. Four credits. DAVIES.

129-130. THE GERMAN NOVEL. A study of the social forces and the foreign influences manifesting themselves in the German novel. Four credits in starred courses. Four credits. Not given in 1916-17.

131-132. THE GERMAN NOVELLE. A study of the technique and development. Assigned readings and reports. Four credits in starred courses. Four credits. BURKHARD.

133-134. ENGLISH INFLUENCES IN GERMAN LITERATURE. A study of the literary relations between England and Germany, with special reference to the effect upon German literature. The subject matter of the course will be varied from year to year. Not given in 1916-17. Four credits in starred courses. Four credits. MYERS.

137-138. GRILLPARZER. His life and works. Assigned readings and reports. Four credits in starred courses. Four credits. GEISSENDOERFER.

143-144. HEINE. His life and works. Assigned readings and reports. GRAVES.

PRIMARILY FOR GRADUATE STUDENTS

225-226. LITERARY PROBLEMS SEMINAR. The subject to be investigated will be announced from year to year. Subject for 1917-18, the Social Drama. Not given in 1916-17. SCHLENKER.

231-232. FAUST SEMINAR. SCHLENKER.

## GREEK

Professors JOHN CORRIN HUTCHINSON, CHARLES ALBERT SAVAGE.

*Prerequisites.* For major work, Courses 101, 102 or their equivalent. For minor work, Courses 51, 52 or their equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. LYRIC POETRY. Selections from the elegiac, iambic, lyric, and bucolic poets. Three times a week. Greek 51 or 52. Three credits. HUTCHINSON.

102. TRAGEDY. Aeschylus or Sophocles. 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. Greek 7 or 101. Three credits. SAVAGE.

103. THE SEPTUAGINT. Especially intended for those who are preparing for the ministry or for some other form of religious work. Three times a week. Greek 51. Three credits. HUTCHINSON.

104. THE NEW TESTAMENT. Especially intended for those who are preparing for the ministry or for some other form of religious work. Three times a week. Greek 51. Three credits. HUTCHINSON.

PRIMARILY FOR GRADUATE STUDENTS

201. PHILOSOPHY (advanced). Plato's *Republic*. Three times a week. HUTCHINSON.

203. ORATORY (advanced). A study of the development of oratorical style among the Greeks. Three times a week. SAVAGE.

204. EPIC POETRY (advanced). The *Iliad* or *Odyssey*. An intensive study of Homer with some attention to the Homeric question. Three times a week. HUTCHINSON.

205. SEMINAR IN ORATORY OR PHILOSOPHY. Given in connection with Demosthenes' *De Corona* or Plato's *Republic*. Once a week. HUTCHINSON, SAVAGE.

206. SEMINAR IN EPIC OR DRAMATIC POETRY. Given in connection with Courses 102 and 204. Once a week. HUTCHINSON, SAVAGE.

## HISTORY

Professors GUY STANTON FORD, CARL LOTUS BECKER, WILLIAM STEARNS DAVIS, ALBERT BEEBE WHITE; Associate Professor WALLACE NOTESTEIN; Assistant Professors SOLON JUSTUS BUCK, AUGUST CHARLES KREY.

*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 of these courses, with credits not exceeding twelve hours. For the other six 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 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.

## COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. THE FRENCH REVOLUTION. A study of the conditions in France at the opening of the Revolution, and of the revolutionary movement from 1789 to 1799. Nine credits prerequisite. Three credits. BECKER.

104. THE NEAR EAST. Turkey, the Balkan States, and modern European diplomacy, especially as it has centered on the eastern question, with special reference to the Nineteenth century and to the causes of the war of 1914. Nine credits prerequisite. Three credits. DAVIS.

121-122. HISTORY OF GREECE. Greek states until their incorporation into Roman Empire. Prerequisites, nine credits in history, or six credits in history and major in Greek, and no previous course in Greek history. Alternates with Course 22. Not offered in 1916-17. Six credits. DAVIS.

123-124. HISTORY OF ROME. Social and political development, with considerable attention to cultural subjects. Prerequisites, nine credits in history, or six credits in history and a major in Latin. Alternates with Course 24. Six credits. DAVIS.

125. HISTORY OF THE OLD ORIENT. Origin of Egyptians, Babylonians, Assyrians, and Persians. Main features of their history and civilization. History of Hebrews discussed to far as it bears upon general Oriental problems. Three credits. DAVIS.

133-134. ANCIENT CIVILIZATION. First semester, Greece; second, Rome. Social and intellectual life, especially factors persisting to the present. Prerequisites, twelve credits in history, or six credits in history and major in Greek or Latin. Six credits. DAVIS.

136. OUTLINES OF PRUSSIAN HISTORY TO THE DEATH OF FREDERICK THE GREAT. Three credits. FORD.

137. ENGLISH CONSTITUTIONAL HISTORY. Origin and early development of the English government, with emphasis upon judicial institutions. Three credits. WHITE.

141. THE WEST IN AMERICAN HISTORY TO 1815. The westward movement of population and civilization; its political, economic, and social aspects; and the results upon national development. Three credits BUCK.

144. HISTORY OF MINNESOTA SINCE 1815. The settlement and development —political, economic, and social—of a typical American commonwealth. Three credits. BUCK.

## ADVANCED OR INTENSIVE COURSES

154. THE AMERICAN REVOLUTION. A study of the conditions in the American colonies and in England that led to the Revolutionary War, and of the political, military, and diplomatic events of the war itself. Three credits. BECKER.

162. THE BEGINNINGS OF PARLIAMENT. Parliamentary beginnings from Norman conquest to Edward I, based wholly on original sources. Prerequisites, twelve credits in history, including Courses 3-4; permission of instructor; knowledge of high-school Latin. Three credits. WHITE.

163. ORIGIN OF THE ENGLISH JUDICIAL SYSTEM. The origin and early development of the most distinctive features in England's present day courts and procedure. Prerequisites, same as Course 162. Not offered in 1916-17. WHITE.

171-172. GERMAN HISTORY. A general survey with special reference to the rise of Brandenburg-Prussia since 1640. Prerequisites, the permission of the instructor; twelve credits in History, or History 1-2 and a major in German. Not given in 1916-17. FORD.

181. ENGLISH BACKGROUNDS OF AMERICAN HISTORY. A survey of the political and social institutions of England in the reign of Charles I, with special emphasis upon the local institutions. Three credits. NOTESTEIN.

182. ENGLISH COLONIZATION IN AMERICA. Alternates with Course 184. A study of institutions in New England and Virginia. Three credits. NOTESTEIN.

184. STUART PERIOD. English 111-112 is strongly recommended as a desirable reinforcing subject. Alternates with Course 182. Not offered in 1916-17. NOTESTEIN.

191. SOCIAL AND ECONOMIC EUROPE IN THE AGE OF THE CRUSADES. A study of Europe and the Latin East during the twelfth and thirteenth centuries. A reading knowledge of two of the following languages: French, German, Latin, is required. Three credits. KREY.

## PRIMARILY FOR GRADUATE STUDENTS

201-202. HISTORICAL BIBLIOGRAPHY AND CRITICISM. Required of candidates for advanced degrees in History who do not present evidence of similar training elsewhere. FORD, et al.

203-204. SEMINAR IN ROMAN HISTORY. Political and administrative institutions of the Roman Empire, Augustus to Alexander Severus. DAVIS.

205-206. SEMINAR IN AMERICAN HISTORY. Studies in the history of the West, especially the upper Mississippi valley. BUCK.

207-208. SEMINAR IN MODERN EUROPEAN HISTORY. A study of revolutions and reform movements in Europe outside France. FORD.

209-210. SEMINAR IN ENGLISH HISTORY. Institutional studies, especially in the twelfth, thirteenth, and seventeenth centuries. WHITE, NOTESTEIN.

211-212. SEMINAR IN MEDIEVAL EUROPEAN HISTORY. Special problems in the period of the Crusades. KREY.

213-214. SEMINAR IN THE HISTORY OF THE EIGHTEENTH CENTURY. Intensive study of certain aspects of the American or French Revolutions. BECKER.

## HOME ECONOMICS

Professor JOSEPHINE T. BERRY; Assistant Professor ALICE BIESTER.

*Prerequisites.* For major or minor work, General Chemistry and Qualitative Analysis, six credits; Organic Chemistry, three credits; Quantitative Methods, three credits; Zoology, six credits; Physiology, three credits; Bacteriology, three credits; Foods and Cookery, and Food Economics, six credits.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101-102. NUTRITION. A study of the chemistry and physiology of metabolism, involving a qualitative examination of the food principles; of the body tissues; of salivary, gastric, and pancreatic digestion; of blood, bile, milk; urine analysis; metabolism experiments. Five credits. BERRY, BIESTER.

### PRIMARILY FOR GRADUATE STUDENTS

201-202. SEMINAR. Meetings for the discussion of current literature, the formulation of research problems, and appropriate methods of research. Two credits. BERRY, BIESTER.

203-204. RESEARCH PROBLEMS IN NUTRITION. BERRY, BIESTER.

## HORTICULTURE

Associate Professors LEROY CADY, MAXWELL J. DORSEY; Assistant Professors WILFRED G. BRIERLEY, RICHARD WELLINGTON.

*Prerequisites.* For major work, twelve credits; for minor work, six credits in the department in addition to two years in Botany and one year in Entomology.

101. ADVANCED FRUIT GROWING. Lectures, laboratory, and special problems. A study in detail of the various tree fruits. Alternates with Course 103. Horticulture 4 and 22 or equivalents. Three credits. BRIERLEY.

103. TROPICAL FRUITS. Lectures, references, and special problems. A study of the various tropical, sub-tropical, and citrus fruits. Alternates with Course 101. Horticulture 4 and 22 or equivalents. Three credits. Not given 1916-17. BRIERLEY.

105. SYSTEMATIC POMOLOGY. The classification and distribution of temperate, sub-tropical, and tropical fruits; technical description, identi-

fication, and general study of the more important varieties; judging of fruits; fruit literature. Lectures, laboratory work, references. Horticulture 4 and 22. Three credits. WELLINGTON.

107. ORCHARD MANAGEMENT. Lectures, references, laboratory, and special problems. A study of the principal problems connected with the management of orchard and small fruit tracts. Offered in alternate years. Horticulture 4, 19 and 22. Three credits. Not given in 1916-17. BRIERLEY.

131. ADVANCED MARKET GARDENING. Lectures, references, and special problems. A study in detail of the various vegetables. Horticulture 32. Three credits. WELLINGTON.

151-152. ADVANCED FLORICULTURE. Lectures, assigned readings, laboratory, and special problems dealing with the culture, botany, and history of florists' plants and methods of greenhouse management. Horticulture 50 and 54. Three or six credits. CADY.

191. HORTICULTURAL LITERATURE. This course includes a critical study of foreign and native horticultural literature and methods used in the preparation of fruit monographs and bulletins. A knowledge of French and German will be a valuable asset. Lectures. Horticulture 4. Three credits. WELLINGTON.

193-194. HORTICULTURAL SEMINAR. Required of all graduate students and of seniors electing special problem work. The course is also open to properly qualified juniors. Reports and discussions of problems and investigational work; first, as projected; second, in development; and third, as completed. Work to continue throughout year. Six credits. Horticultural Staff in charge.

PRIMARILY FOR GRADUATE STUDENTS

201-202. FRUIT-GROWING RESEARCH. Special problems in fruit culture. Students will be required to continue the work over at least one summer. Open to those who have specialized in fruit-growing. WELLINGTON, BRIERLEY.

203-204. FRUIT-MARKETING RESEARCH. Special problems in fruit-harvesting, by-products, storage, and marketing. Students must arrange schedules to allow for concentration on problem at most appropriate season. Open to those who have specialized in fruit-growing. BRIERLEY, WELLINGTON.

205-206. FRUIT-BREEDING RESEARCH. Consists of (a) some thesis problem, (b) development of laboratory technique in breeding. Work involves reading in heredity, cytology, biometry. Students required to continue work over one summer. Open to limited number specializing in fruit-breeding. DORSEY.

231-232. VEGETABLE GROWING RESEARCH. Special problems in vegetable culture. Students will be required to continue the work over at least

one summer. Open to those who have specialized in vegetable-growing. WELLINGTON, BRIERLEY.

## LATIN

Professors JOSEPH B. PIKE, JOHN E. GRANRUD.

*Prerequisites.* Courses 5 to 58 and six 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, courses 203-204 and 205-206; or one of them and in addition one course each semester selected from courses 104 to 110. 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, course 203-204 or course 205-206.

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 semester in addition to one seminar course and one of the courses listed below, one course in advanced Greek (i.e., in advance of two 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 authors, will be required.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

104. LATIN WRITING. Study of Latin prose style. Twice a week. Not offered in 1916-17. Latin 58. Two credits. PIKE.

105. ROMAN ELEGY. Selections from Catullus, Tibullus, Propertius, and Ovid. The origin, development, and technique of Roman elegy. Three times a week. Latin 58. Three credits. Not offered in 1916-17. GRANRUD.

106. THE ROMAN NOVEL. *Cupid and Psyche* by Apuleius and *Trimalchio's Dinner* by Petronius. A study of the ancient novel. Three times a week. Alternates with course 104. Latin 58. Three credits. PIKE.

107. LETTERS OF CICERO. Selections from his correspondence. A study of his life and times, his literary art and methods. Three times a week. Alternates with Course 105. Latin 58. Three credits. GRANRUD.

108. TACITUS. Selections from his works. A study of the development of Roman historical literature, and of the sources, methods, and literary characteristics of Tacitus. Three times a week. Latin 58. Three credits. Not offered in 1916-17. GRANRUD.

110. ROMAN SATIRE. Selections from Juvenal. The beginnings, evolution, and distinctive qualities of Roman satire. Juvenal as a literary

artist and a moralist. Three times a week. Alternates with course 108. Latin 58. Three credits. GRANRUD.

PRIMARILY FOR GRADUATE STUDENTS

201-202. LUCRETIUS. Graduate seminar in the interpretation of the text of *De Rerum Natura,* with a study of Lucretius' philosophy and his sources. Once a week (double hour), a third hour by arrangement. Not offered in 1916-17. PIKE.

203-204. SENECA. Graduate seminar in selections from the works of Seneca. Annotations of selections not annotated in modern tongues. Study of Stoicism. Once a week (double hour), third hour by arrangement. Alternates with course 201-202. PIKE.

205-206. CICERO. Graduate seminar in the history and theory of Roman eloquence. Selections from the rhetorical works of Cicero will form the basis of the course, and special attention will be devoted to his theory of an artistic style. Once a week (double hour), a third hour by arrangement. GRANRUD.

## MATHEMATICS

Professors GEORGE N. BAUER, WILLIAM E. BROOKE, WILLIAM H. KIRCHNER, FRANCIS P. LEAVENWORTH; Associate Professor WILLIAM H. BUSSEY; Assistant Professors HANS H. DALAKER, BURT L. NEWKIRK, ROYAL R. SHUMWAY, HERMON L. SLOBIN, ANTHONY L. UNDERHILL.

*Prerequisites.* For major or minor work, six credits in addition to Integral Calculus and Solid Analytical Geometry.

Not more than two semester courses, of three credits each, that are open to juniors, seniors, and graduates, may be counted toward a graduate degree.

The mathematical club, consisting of members of the faculty and advanced students, meets every two weeks throughout the university year. It offers an opportunity to acquire breadth of knowledge of mathematics as a whole. The work consists of reports of current research and lectures on classical mathematical achievements of the past.

The following courses in pure and applied mathematics are offered by members of the Department of Mathematics of the College of Science, Literature, and the Arts, and the Departments of Drawing and Descriptive Geometry and Mathematics and Mechanics of the College of Engineering.

OPEN TO GRADUATE AND ADVANCED UNDERGRADUATE STUDENTS

102. ADVANCED PLANE ANALYTIC GEOMETRY. Mathematics 11. Three credits. BUSSEY.

104. MODERN SYNTHETIC GEOMETRY. A study of geometry based upon the method of central projection without the use of coördinates. Mathematics 11. Three credits. BUSSEY.

106. DIFFERENTIAL EQUATIONS. An introductory course dealing with the interpretation and methods of solving ordinary differential equations. Mathematics 51. Three credits. SLOBIN.

107. ADVANCED DIFFERENTIAL CALCULUS. Infinitesimals of different orders, partial and total derivatives, introduction to infinite series, Taylor's and Maclaurin's Expansions together with applications of the calculus to plane curves. Mathematics 51. Three credits. UNDERHILL.

108. ADVANCED INTEGRAL CALCULUS. The definite integral as the limit of a sum, improper integrals, the Beta and Gamma functions, elliptic integrals, differentiation and integration under the sign of integration, applications to geometry and mechanics. Mathematics 51 and 101. Three credits. BAUER.

109-110. PROJECTIVE GEOMETRY. General considerations and constructions. Representation, projection, and transformation. Collineation. Curves and polar systems. Applications. KIRCHNER.

111-112. ADVANCED DESCRIPTIVE GEOMETRY. Methods of representation; parallel and central projection. Geometrography, axonometry, and photogrammetry. KIRCHNER.

113a,b. PERSPECTIVE. The principles and practice of perspective, including shadows, reflections, distortions, corrections, systems, methods, the practical problem, and inverse constructions. KIRCHNER.

117a,b. VECTOR ANALYSIS. Applications to geometry, mechanics, and physics. BROOKE.

118a,b. APPLICATIONS OF CALCULUS. A course designed to give a more thoro knowledge of the Calculus in its relation to Engineering problems. A selected list of problems in the various branches of Engineering. Mathematics and Mechanics 76. Three credits. BROOKE.

119a,b. MODERN HIGHER ALGEBRA. Mathematics 51. Three credits. SHUMWAY.

125-126. DIFFERENTIAL GEOMETRY. Course 101, which is a prerequisite, may be taken simultaneously. Application of calculus to the geometry of plane curves, space curves and surfaces. Six credits. UNDERHILL.

127a,b. INFINITE SERIES. (Three hours.) Open to seniors and graduate students who have gained seventeen credits in addition to algebra and trigonometry. Three credits. BAUER.

140. METHOD OF LEAST SQUARES. (Two hours.) The combination and adjustment of observations and the discussion of their precision as applied especially to engineering physics and astronomy. Mathematics 51. Two credits. LEAVENWORTH.

151. MECHANICS OF MATERIALS. The theory of beams, columns, shafts, reinforced concrete, hollow cylinders and spheres, rollers, and plates. The general theory of internal stress. Three credits. BROOKE, NEWKIRK.

152. HYDRAULICS. Laws of the equilibrium, pressure, and flow of liquids. Three credits. BROOKE, NEWKIRK.

153. THERMODYNAMICS. The thermodynamics of steam and gas engines. The mechanical theory of heat as applied to steam, oil, gas, and hot air engines, and to compressors; including the use of steam tables, entropy diagrams, etc. Three credits. BROOKE.

154. STEAM AND HYDRAULIC TURBINES. Various types of turbines, velocity, impulse, and reaction; nozzles, vanes, discs, bearings, governors, thermodynamic analysis, and efficiency. Three credits. BROOKE.

### PRIMARILY FOR GRADUATE STUDENTS

201a,b. THEORY OF NUMBERS. (Three hours.) BUSSEY.

203-204. THEORY OF FINITE GROUPS. (Three hours.) BUSSEY.

207a,b. HIGHER PLANE CURVES. (Three hours.) SLOBIN.

209-210. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. (Three hours.) BAUER, DALAKER.

211. THEORY OF FUNCTIONS OF REAL VARIABLES. (Three hours.) UNDERHILL.

212. CALCULUS OF VARIATIONS. (Three hours.) UNDERHILL.

215-216. ADVANCED DIFFERENTIAL EQUATIONS. (Three hours.) Ordinary and partial differential equations; general theory of linear differential equations; most important differential equations of mathematical physics; elements and applications of theory of functions arising in theory of differential equations. SLOBIN.

251-252. ADVANCED ANALYTICAL MECHANICS. (Three hours.) BROOKE.

253-254. ADVANCED TECHNICAL MECHANICS. (Three hours.) Special problems in the dynamics of machinery; vibrations, balancing, whirling shafts, rapidly rotating disks, dynamical stability, gyroscope. NEWKIRK.

255-256. THE MATHEMATICS THEORY OF ELASTICITY. (Three hours.) BROOKE.

## MECHANICAL ENGINEERING

Professor JOHN J. FLATHER; Assistant Professor JOHN V. MARTENIS; Instructor WALLACE H. MARTIN.

*Prerequisites.* For major work, eighteen credits; for minor work, six credits in the department.

Exemption from the language requirements for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

111. INDUSTRIAL MANAGEMENT. Shop and factory organization and management; cost and wage systems. Depreciation of equipment. Machine burden. Time studies. Two credits. FLATHER.

112. INDUSTRIAL MANAGEMENT. Same as Course 111. FLATHER.

117. MACHINE DESIGN. Calculation and design of such machine parts as fastenings, bearings, rotating pieces, pulleys, spur gearing, bevel gears, spiral gears, and rope driving. Recitations, lectures, and drawing room practice. Mathematics 76. Three credits. FLATHER, MARTENIS.

118. MACHINE DESIGN. Continuation of Course 117. First six weeks of semester. One credit. FLATHER, MARTENIS.

119. GAS ENGINES AND PRODUCERS. Principles of two-cycle and four-cycle engines; cylinder construction and arrangement; valve gears and starting mechanisms; speed control, ignition, and cooling. Application of the indicator and consideration of indicator diagrams. A study of the power-gas producer. Chemistry 38. Three credits. MARTIN.

120. MACHINE DESIGN. Application of graphical methods to the design of valve-gears and link motions. Zeuner diagrams, indicator cards. Lectures and drawing-room practice. Last twelve weeks. Mechanical Engineering 130. Two credits. FLATHER, MARTENIS.

121. STEAM ENGINE DESIGN. Calculations and working drawings for a high speed automatic steam engine. Theoretical diagrams and determination of details. Mechanical Engineering 130. Three credits. FLATHER, MARTIN.

123. GAS ENGINE DESIGN. Calculations and working drawings for a single cylinder stationary gas engine. Theoretical diagrams and details of parts. Mechanical Engineering 119. Three credits. FLATHER, MARTIN.

124. ADVANCED MACHINE DESIGN. Original design, including machinery for changing size and form, cranes, pumping and transmission machinery and engineering appliances.: Lectures, problems and drawing room practice. Mechanical Engineering 117. Three credits. FLATHER, MARTIN.

125. TOOL DESIGN. Designs of tools for manufacturing inter-changeable parts; jigs and milling fixtures. Three credits. FLATHER.

126. TOOL DESIGN. Same as Course 125. FLATHER.

127. POWER PLANT DESIGN. Problems, designs and estimates for power plants, central stations and factory equipment. Selection of motive powers, relative advantages of steam and producer gas plants, choice of engines and boilers; pumps, shafting, piping, and accessories. Mechanical Engineering 130, 131. Three credits. FLATHER.

128. POWER PLANT DESIGN. Same as Course 127. FLATHER.

130. STEAM BOILERS AND ENGINES. Construction of steam boilers, settings, furnaces and stokers, smoke prevention, chimneys, evaporation. Mechanics of steam engine; slide valve; Zeuner diagram, Corliss and other valves; governors; indicator cards; compounding. Four credits. FLATHER, MARTIN.

131. MEASUREMENT OF POWER. A study of the methods employed in measuring power. Dynamometers. Pony brakes; power required to drive machine tools and shafting. Selection of motors for industrial plants. Mathematics 152. Two credits. FLATHER.

132. COMPRESSED AIR AND REFRIGERATING MACHINERY. Air compressors and motors, and the transmission of power by compressed air. Principles of refrigeration. A study of the various types of refrigerating machines, refrigerants, and applications to ice-making, cold storage, cooling of air, liquids and solids. Lectures and recitations. Three credits. MARTENIS.

137. RAILWAY TECHNOLOGY. The object of this course is to familiarize the student with the practical details of construction of locomotives, and consists in part of systematic course of visits to the various railroad shops in the vicinity; lectures and recitations. Two credits. MARTENIS, MARTIN.

139. LOCOMOTIVE CONSTRUCTION. Lectures, reading, and recitations on design and construction of locomotives, supplementing Course 137. Mechanical Engineering 137. Two credits. MARTENIS.

140. RAILWAY DESIGN. This course treats (a) of link and valve motions; continuation of Course 139 with special applications of Stephenson and Walschaert gears; (b) of locomotives and car details; (c) of locomotive boiler; (d) of assembled parts. Mechanical Engineering 137. Three credits. FLATHER.

PRIMARILY FOR GRADUATE STUDENTS

201-202. SEMINAR. FLATHER, MARTENIS, MARTIN.

## MEDICINE

(Including General Medicine and Nervous and Mental Diseases.)

Professors CHRISTOPHER GRAHAM, ARTHUR S. HAMILTON, THOMAS B. HARTZELL, HENRY S. PLUMMER, LEONARD G. ROWNTREE, S. MARX WHITE; Associate Professors HERBERT Z. GIFFIN, WALTER D. SHELDON; Assistant Professors GEORGE B. EUSTERMAN, ARCHIBALD H. LOGAN, ROBERT D. MUSSEY, HENRY L. ULRICH.

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.

For the description of courses offered, see special bulletin of Graduate Work in Medicine.

## METALLOGRAPHY

Assistant Professor SAMUEL L. HOYT.

*Prerequisites.* For major work, adequate preparation in the sciences fundamental to metallography (chemistry, physics, geology, technical subjects), the general requirements stated on page 8 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.

153-154. METALLOGRAPHY. 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 a week; both semesters. Chemistry 1-2, Physics 1. Five credits. HOYT.

155-156. METALLOGRAPHY APPLIED TO THE STUDY OF GEOLOGY. Physicochemical principles and their application to the study of the genesis of rocks and ore bodies. Microscopical examination and synthetic preparation of opaque minerals. Two lectures, two laboratory hours a week; both semesters. Geology 4, 5, Mineralogy 18. Three credits. HOYT.

160. METALLOGRAPHY FOR CHEMICAL STUDENTS. The preparation of metallic alloys; their microscopical and thermal analysis. Steel and other commercial alloys with particular reference to chemical metallurgy. Corrosion of steel and non-ferrous alloys. Metallography applied to analytical chemistry. Chemistry 12, Physics 1-2. Three credits. HOYT.

201-202. ADVANCED METALLOGRAPHY. Technical and scientific research. Special problems in metallography. Seminar work on recent advances in metallography. Hours to be arranged. Metallurgy 154. Two credits. HOYT.

## OBSTETRICS AND GYNECOLOGY

Professor JENNINGS C. LITZENBERG.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## OPHTHALMOLOGY, OTOLOGY, RHINOLOGY AND LARYNGOLOGY

Professor FRANK C. TODD; Associate Professors CARL FISHER, JUSTUS MATTHEWS, WILLIAM R. MURRAY; Assistant Professor GORDON B. NEW.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

Professors HAROLD E. ROBERTSON, EDWARD G. ROSENOW, LOUIS B. WILSON; Associate Professors ELEXIOUS T. BELL, WINFORD P. LARSON, WILLIAM C. MACCARTY, ARTHUR H. SANFORD; Assistant Professor WAYNE W. BISSELL.

Graduate students who desire to take their major or minor work in pathology or bacteriology 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.

Students who elect their major work in bacteriology must present credits of general bacteriology or its equivalent.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## PEDIATRICS

Professor JULIUS P. SEDGWICK.

The graduate work of the Department of Pediatrics is arranged with the intention:

(a) to prepare students to become competent pediatrists;
(b) to put them in position to attack original pediatric problems;
(c) to make them competent teachers in the subject.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## PHARMACOLOGY AND THERAPEUTICS

Professor ARTHUR D. HIRSCHFELDER; Associate Professor EDGAR D. BROWN; Assistant Professor ROBERT A. HALL.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## PHILOSOPHY AND PSYCHOLOGY

Professor NORMAN WILDE; Associate Professor DAVID F. SWENSON; Assistant Professors RUPERT C. LODGE, JOSEPH PETERSON, HERBERT WOODROW; Instructor JACOB KANTOR.

*Prerequisites.* Major in philosophy, twelve credits including three in psychology and three in logic; major in psychology, twelve credits including six in psychology; minor in philosophy, twelve credits; minor in psychology, twelve credits including three in psychology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101a, or 101b. EXPERIMENTAL PSYCHOLOGY. Laboratory experiments in the chief mental processes, to give first-hand familiarity with methods and results. Three times a week. Psychology 1-2. Three credits. WOODROW.

105. MENTAL RETARDATION. A study of abnormalities in the development of exceptional children; methods of training. Once a week. Psychology 1-2. Two credits. WOODROW.

109. PSYCHOLOGICAL PRINCIPLES. A study of fundamental laws. Twelve credits including courses 1-2 and 9. Three credits. KANTOR.

110. COMPARATIVE PSYCHOLOGY. A study of animal behavior and an interpretation of its psychological significance. Three times a week. PETERSON.

115-116. SEMINAR IN PSYCHOLOGY. Major or minor research in experimental, analytic, genetic, or comparative psychology. WOODROW.

118. ADVANCED ETHICS. A study of the main types of ethical theory. Six credits prerequisite. Three credits. WILDE.

121. ANCIENT AND MEDIEVAL PHILOSOPHY. Outline of history of thought desirable in general education. Emphasis placed upon human significance of philosophy rather than technical aspect. Main work, philosophies of Plato and Aristotle, but later development traced as far as Renaissance. Six credits prerequisite. Three credits. WILDE.

122. MODERN PHILOSOPHY. Continues Course 121. Representative systems of modern philosophy from the Renaissance to the nineteenth century; to prepare students to understand philosophical tendencies of the present; study of Bacon, Descartes, Spinoza, Leibnitz, Locke, Berkeley, Hume, Kant. Six credits prerequisite. Three credits. WILDE.

123. SCANDINAVIAN PHILOSOPHY . The philosophical thought of the Nineteenth century in Scandinavian countries, including a comparative study of Boström and Kierkegaard. Reading knowledge of Scandinavian required. Nine credits prerequisite. Three credits. SWENSON.

124. THE PHILOSOPHY OF THE NINETEENTH CENTURY. Continues Course 122. Modern currents of thought from the Idealism of Fichte and Hegel, to the philosophy of evolution, pragmatism, and the new realism. Six credits prerequisits. Three credits. WILDE.

126. LOGIC OF SCIENCE. Introduction to philosophy through the medium of the special sciences, its aim being to suggest a system of the sciences through a discussion of nature and relations of their fundamental principles. Nine credits including Philosophy 9. Three credits. SWENSON.

127. METAPHYSICS. A critical and constructive study of theories of knowledge and reality. Not given in 1916-17.

129-130. SEMINAR IN PHILOSOPHY. Individual investigation in philosophy. Studies in either ancient or modern philosophy and ethics; critical and constructive studies of logic, metaphysics, or ethics. Character of work and general topic for year ascertained by consultation with department. Twelve credits in Philosophy. Six credits. WILDE.

134. THE PHILOSOPHY OF PLATO. The reading and discussion of the principal dialogues with a view to understanding the problem and method of Greek philosophy as illustrated in the writings of Plato. Philosophy 121 or 122 or 124. Three credits. WILDE.

## PHYSICS

Professors HENRY A. ERIKSON, ANTHONY ZELENY; Assistant Professor LOUIS W. MCKEEHAN; Instructors ARTHUR H. COMPTON, JOHN T. TATE.

*Prerequisites.* For major work, Mathematics 11 and 51 and fourteen credits in Physics beginning with 1, 7 or 21. For minor work, the fourteen credits in Physics just mentioned.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

121-122. DYNAMICS. Some problems essential for advanced physics and chemistry. Physics 2 or 10 or (12) and Mathematics 51. Six credits. Not offered during 1916-17. TATE.

155. SPECTROMETRY. Measurements involving the use of prism spectroscopes, plane transmission and reflection gratings, concave grating, and the interferometers. Physics 52 and 82. Three credits. ERIKSON.

161. ELECTRICITY AND MAGNETISM. The phenomena accompanying the passage of electricity through solids, liquids, and gases. One lecture, two recitations, and one two-hour laboratory period a week. Physics 13. Three credits. ZELENY.

162. ELECTRICAL MEASUREMENTS. Devoted mainly to the study and measurement of capacity, inductance, and magnetic induction. Physics 13. Two credits. ZELENY.

165. ELECTRICAL MEASUREMENTS OF PRECISION. Making of standard cells, calibration of Wheatstone box bridge; adjustment of resistances, ammeters, and voltmeters; use of the potentiometer; problems involving capacity, inductance, and magnetic flux; measurement of temperatures by electrical methods. Physics 162. Three credits. ZELENY.

177. RADIOACTIVITY. Lectures, experimental and descriptive; the various theories and methods of investigation. Detailed study of the radioactive elements. Physics 13 and Mathematics 11. Three credits. MCKEEHAN.

178. RADIOACTIVITY MEASUREMENTS. Laboratory technique in radioactivity. Physics 177. Three credits. MCKEEHAN.

181. ADVANCED PHYSICAL MEASUREMENTS. Individual work in the laboratory on topics specially chosen to serve best the needs and capacity of each student; intended to introduce him to some of the more intricate physical measurements. Physics 82. Three credits. ERIKSON, ZELENY, MCKEEHAN.

182. ADVANCED PHYSICAL MEASUREMENTS. Continuation of Course 181. Physics 181. Three credits.

191a,b. ELEMENTARY PHYSICAL INVESTIGATION. The experimental or theoretical study of physical phenomena, the nature or laws of which are not yet understood. Physics 82. Three credits. ERIKSON, ZELENY, MCKEEHAN.

192a,b. ELEMENTARY PHYSICAL INVESTIGATION. Continuation of Course 191. Physics 191. Three credits.

## COURSES PRIMARILY FOR GRADUATE STUDENTS

221-222. ADVANCED ANALYTICAL MECHANICS. Dynamics and statics of particles and rigid bodies. Elasticity and hydromechanics. TATE.

247. THE KINETIC THEORY OF GASES. Kinetic explanation of the principal properties of gases at ordinary and at low pressures, with a few applications to liquids and solids.

248. THERMAL RADIATION AND QUANTUM THEORY. The properties of black radiation; laws of Kirchhoff, Stefan, and Wien. Equipartition of energy and its bearing on thermal radiation; Planck's quantum hypothesis and radiation law. Other applications of quantum theory. Not offered in 1916-17.

249. TEMPERATURE AND HEAT MEASUREMENTS. Precision measurements with liquid and gas thermometers, thermoelectric and resistance thermometers, and radiation pyrometers; self-recording instruments. Modern methods employed in the measurement of the thermal constants at all temperatures. Lectures, laboratory work. ZELENY.

251. ADVANCED OPTICS. Not offered in 1916-17. ERIKSON.

261-262. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM. A comprehensive study of the modern Maxwell-Lorentz theory, including the electromagnetic theory of light. COMPTON.

272. DISCHARGE OF ELECTRICITY THROUGH GASES. Conductivity imparted to gases by X-rays, ultra-violet light, radioactive substances, glowing metals; discharge of electricity from points in vacuum tubes; spark and arc discharges; methods of measuring velocity of ions. .....

273. MEASUREMENTS IN THE DISCHARGE OF ELECTRICITY THROUGH GASES. Not offered in 1916-17.

276. ELECTRON THEORY. Not offered in 1916-17. ERIKSON.

293-294. RESEARCH IN ELECTROKINETICS. Experimental investigations. This course may be continued through any desired number of years. ZELENY.

295-296. RESEARCH IN IONIZATION. Experimental investigations. This course may be continued through any desired number of years. ERIKSON.

297-298. RESEARCH IN RADIOACTIVITY. Experimental investigations. This course may be continued through any desired number of years. MCKEEHAN.

## PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

Professor ELIAS P. LYON; Associate Professors RICHARD O. BEARD, FREDERICK H. SCOTT; Assistant Professors EDWARD C. KENDALL, JESSE F. MCCLENDON; Instructors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE.

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, six credits; general chemistry, six credits, and college physics are prerequisites. (In exceptional cases high-school physics may be accepted.) For a major, organic chemistry is an additional prerequisite, and physical chemistry is desirable.

For a minor or major in physiologic chemistry, general and organic chemistry, twelve credits, and prerequisites, and physical chemistry is desirable.

In addition, each student majoring in physiology or physiologic chemistry must have had the general courses, 102, 103, 104, in this department, or the equivalent.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## PLANT PATHOLOGY AND BOTANY

Professor EDWARD M. FREEMAN; Assistant Professor ELVIN C. STAKMAN.

*Prerequisites.* The minimum requirement is (a) three years (eighteen credits) in Botany, one year (six credits) of which shall be Mycology; (b) General Bacteriology one-half year (three credits) or some equivalent; (c) one year (six credits) in Pathology—preferably two years (twelve credits).

103. BACTERIAL DISEASES. Morphology, classification, and physiology of phytopathogenic bacteria; general phenomena of bacterial infection and host reaction; detailed study of plant diseases caused by bacteria and filterable viruses. Required for specializing in pathology or entomology. Course 1 and Pathology 58. Three credits. STAKMAN.

104. PRINCIPLES OF PATHOLOGY. Comparative biology of plant pathogens; pathological plant anatomy, parasitism, biologic specialization, resist-

ance and immunity. Required for specializing in pathology or entomology. Course 1 and Pathology 58. Three credits. STAKMAN.

201-202. GRADUATE PATHOLOGY. Open to graduates who have had two years of general botany and Pathology 1, 101, 102 and Pathology 4, or its equivalent. A special historical study of the botanical basis of plant pathology. Special problems. For minor or major. Twice a week. FREEMAN, STAKMAN.

203-204. SPECIAL PROBLEMS IN GRADUATE PATHOLOGY. Special assignment of work in laboratory and field problems in pathological research. Arrange. FREEMAN, STAKMAN.

## POLITICAL SCIENCE

Professors WILLIAM A. SCHAPER, CEPHAS D. ALLIN, *JEREMIAH S. YOUNG; Instructor BEN A. ARNESON.

*Prerequisites.* For major work, twelve credits; for minor work, six credits in the subject.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. AMERICAN CONSTITUTIONAL LAW. Constitutional law, its origin and nature; American constitutions, how made and amended; the courts and the development of the Constitution; Federal and State relations; the territories, their acquisition and government; citizenship. Six credits prerequisite. Three credits. SCHAPER.

102. MODERN POLITICAL THOUGHT. Nature and purpose of the modern state; sovereignty; the growth of democracy; the decline of individualism; the increase of governmental activities; great contributions to political thought from Hobbes, Locke, and Rousseau to the present time. Six credits prerequisite. Three credits. SCHAPER.

104. POLITICAL PARTIES. Not offered in 1916-17.

105. COMPARATIVE ADMINISTRATION. Administration as a science; its origin and development; analysis of administrative systems of United States, England, France and Germany, with special reference to the law of officers, merit system, and special administrative tribunals. Three credits. ARNESON.

106. LEGISLATIVE POWER AND METHODS. Source and scope of the legislative power; methods used by legislative bodies; current public questions; formulation and defense of legislative bills. Three credits. ARNESON.

108. THE POLICE POWER. Not offered in 1916-17.

109. DIPLOMACY. The growth of international relations; the mode of conducting foreign affairs; diplomatic and consular service; the framing, interpretation and termination of treaties and compacts. Six

* Absent on leave.

credits prerequisite or Political Science 1 and History 156. Three credits. ALLIN.

110. INTERNATIONAL LAW. Nature, sources, and sanction of international law; the status of nations, the rules of peace, neutrality, and war, and the arbitration movement. Political Science 1 and 3, or 109. Three credits. ALLIN.

112. COMPARATIVE FEDERAL GOVERNMENT. Ancient and modern federal unions, especially the constitutions of the United States, Switzerland, Canada, and Australia, the South African Union and the proposals for Imperial federation. Six credits prerequisite. Three credits. ALLIN.

114. THE GOVERNMENT AND POLITICS OF THE BRITISH EMPIRE. The origin, nature, and operation of the British constitution, political parties and principles in Great Britain and the Colonies. Six credits prerequisite, or Political Science 1 and History 7. Three credits. ALLIN.

201-202. SEMINAR IN POLITICAL SCIENCE. Research in the field of Political Science. The discussion of current problems in politics and administration. Six credits. SCHAPER, ALLIN.

## PSYCHOLOGY

See Philosophy and Psychology.

## RHETORIC

Professors JOSEPH M. THOMAS, MARGARET SWEENEY; Assistant Professors DANIEL FORD, CHARLES NICHOLS, SIDNEY F. PATTISON, ANNA H. PHELAN, CHARLES E. SKINNER, HELEN WHITNEY.

*Prerequisites.* For major work, not less than eighteen credit hours in Rhetoric and twelve credit hours in English. For minor work, not less than a minor in Rhetoric.

In cases where the nature of the work to be undertaken by candidates for the Master's degree warrants it, Greek or Latin may be substituted for French or German.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

102. VERSIFICATION. The nature of poetry and a detailed analysis of English meters and of the various English verse forms. The theory accompanied by criticism of current poetry, and practice in writing verse. Rhetoric 1-2, 11-12 or 15-16. Three credits. NICHOLS.

103-104. STUDIES IN STRUCTURE AND STYLE. Theory of structure and style; rhetorical analysis of standard English prose; themes based on personal observation, current reading, and investigation; preparation of essays with particular classes of readers in view. Rhetoric 1-2, 11-12 or 15-16. Six credits. WHITNEY.

107. IMITATIVE WRITING. The principles of structure, diction, and style, which underlie the work of leading English writers; application of these principles in both imitative and original compositions. Rhetoric 1-2, 11-12 or 15-16. Three credits. THOMAS.

110. SHORT-STORY WRITING. The technique of the short story accompanied by constructive work in story-writing. Rhetoric 1-2, 11-12 or 15-16. Three credits. THOMAS.

111-112. ESSAY WRITING. Practice in didactic, biographical, critical, informal essays. Two essays a semester. Individual aid given to students in gathering material, planning each paper, and criticism of each essay. Analysis of modern essays. Rhetoric 1-2, 11-12 or 15-16. Six credits. PATTISON.

115-116. DRAMATIC TECHNIQUE. The principles of plotting, characterization, climax, dialogue, and the making of scenarios. The writing of three plays; a dramatization of a short story, an original one-act play, and a three-act play. Required readings, laboratory work in the theater, criticisms of local productions. Open to those who have completed Course 11-12, and who are taking or have taken English 59-60 or 113-114. Six credits. SKINNER.

119-120. SEMINAR IN WRITING. For a limited number of advanced students who write with facility, and who desire personal criticism and direction. Criticism of manuscripts submitted for inspection, with lectures upon the fundamental principles of English composition. Open with special permission to seniors and graduate students who have completed Courses 1-2, 11-12 or 15-16, and at least one other course. Required of Honors Course students. Four credits. THOMAS.

### PRIMARILY FOR GRADUATE STUDENTS

201-202. SEMINAR IN RHETORIC. (Graduate seminar but open to seniors taking the Honors Course.) Lectures, discussions, and reports on study of critical theory beginning with Plato and Aristotle, and lay-special problems of rhetorical theory. The subject for 1916-17: A ing emphasis on the more important English and French writers. Prerequisites, Courses 1-2, 11-12 or 15-16, and at least one other course. For those who are specializing in Rhetoric and Composition. Six credits. SWEENEY.

## ROENTGENOLOGY

Professor RUSSELL D. CARMAN; Assistant Professor ALEXANDER B. MOORE.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## ROMANCE LANGUAGES

Professors EVERETT WARD OLMSTED, COLBERT SEARLES; Assistant Professor RUTH S. PHELPS; Professorial Lecturer PAUL HENRI D'E. MORIN; Instructors FRANCIS D. BARTON, EDWARD H. SIRICH.

*Prerequisites.* For major or minor work, Survey of French Literature; at least two courses in conversation and composition; and at least two century courses. Candidates for the 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 year's work in Latin, and a reading knowledge of a second Romance language and of German.

101-102. FRENCH LITERATURE, EIGHTEENTH CENTURY. Reading and discussions based upon texts and collateral reading. Romance Languages 5-6 or equivalent. Six credits. SEARLES.

103-104. FRENCH LITERATURE, SEVENTEENTH CENTURY. Reading and discussions based upon texts and collateral reading. OLMSTED.

105-106. FRENCH LITERATURE, SIXTEENTH CENTURY. Not given in 1916-17.

107-108. FRENCH LITERATURE. Classicism. Literary studies of the classic French monuments. Romance Languages, 103-104 or equivalent. Four credits. SEARLES.

109-110. LECTURES IN FRENCH. L'exotisme dans les lettres françaises. Romance Languages, 5-6, 51-52 or equivalent. Six credits. MORIN.

111-112. FRENCH ORAL DICTION. Dissertations orales sur des sujets variés. Romance Languages 51-52 or equivalent. Four credits.

113-114. FRENCH SYNTAX AND COMPOSITION. Special studies in characteristic problems of French syntax. Romance Languages 53-54 or equivalent. Two credits.

131-132. SPANISH NOVEL. A study of the development of Spanish fiction from the picaresque novel to that of the present day. Romance Languages 33-34 or equivalent. Four credits. OLMSTED.

141-142. DANTE, PETRARCH, BOCCACCIO. An introduction to the works of these authors; reading in class, lectures, reports, and collateral reading. Romance Languages 41-42 or equivalent. Four credits. PHELPS.

### PRIMARILY FOR GRADUATE STUDENTS

201-202. OLD FRENCH. Two hours per week devoted to French Philology and one hour to the reading of Old French texts. SIRICH.

203-204. OLD SPANISH. Two hours per week devoted to Spanish Philology and one hour to the reading of Old Spanish texts. SIRICH.

205-206. FRENCH SEMINAR. SEARLES.

231-232. SPANISH SEMINAR. OLMSTED.

## SCANDINAVIAN

Professors GISLE BOTHNE, ANDREW A. STOMBERG.

*Prerequisites.* For major work, eighteen credits; for minor work, six credits in the department.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101-102. MODERN NORWEGIAN LITERATURE. Norwegian literature from 1814 to the present day. Scandinavian 1-2 and 3-4. Six credits. BOTHNE.

103. EARLIER NORWEGIAN LITERATURE. History of Literature. Norwegian and Danish folk-songs, Holberg, Oplysuingtiden. Scandinavian 101-102. Three credits. BOTHNE.

104. IBSEN. Lectures, reading, and interpretation. Scandinavian 101-102. Two credits. BOTHNE.

105-106. HISTORY OF NORTHERN EUROPE. History of Scandinavian countries from the earliest period to recent times. Prerequisites: Courses 1-2 and 3-4 or 5-6 and 7-8, or Courses 1-2, 3-4, or 14 in History. Knowledge of Scandinavian languages not required. STOMBERG.

107-108. SWEDISH LITERATURE. History of Swedish literature from 1719 to the present time. History of the literature and study of modern authors, including Selma Lagerlöf, Geijerstam, Strindberg. Scandinavian 5 and 6. Six credits. STOMBERG.

109. STRINDBERG. Lectures, reading, and interpretation. STOMBERG.

112. MODERN DANISH LITERATURE. From Oehlenschläger to the present time. BOTHNE.

113-114. OLD NORSE (Icelandic). Grammar and reading. Gunnlaugs Saga Ormstungu. BOTHNE.

### PRIMARILY FOR GRADUATE STUDENTS

201-202. SEMINAR IN HISTORY OF SCANDINAVIAN LANGUAGES. BOTHNE.

203-204. SEMINAR IN OLD NORSE. THE ELDER EDDA. BOTHNE.

209-210. SEMINAR IN MODERN SWEDISH LANGUAGE AND LITERATURE. The course is based upon Schuck and Warburg's *Illustrated Svensk Litteraturhistoria* and includes a study of special authors. STOMBERG.

215-216. SEMINAR IN NORWEGIAN LITERATURE. The various phases of the cultural development of modern Norway are discussed. The complete works of Bjornson or Ibsen are especially studied. BOTHNE.

## SOCIOLOGY AND ANTHROPOLOGY

Professors ALBERT E. JENKS, ARTHUR J. TODD.

*Prerequisites.* For major work, 18 credits, for minor work, 12 credits in the department.

102. SOCIAL THEORY. The foundations of sociology; the leading American, English, French, and German writers and their methods of approach to the science and the leading results they have secured. Textbook, readings, lectures, essay. Sociology 1 or 3, 9 or 10, and one other course. Three credits. TODD.

104. STATE CARE OF DEPENDENTS, DEFECTIVES, AND DELINQUENTS IN MINNESOTA. Organization, machinery, and function of such institutions as the state hospitals, asylums, training schools, prison, schools for the feeble-minded, the blind, and the deaf. Lectures and readings. Sociology 1 or 3, 9 or 10, and one other course. Two credits. TODD and specialists from the Board of Control and institutions studied.

106. TREATMENT OF THE DELINQUENT CLASSES. The causes of crime; nature of the criminal; criminal procedure; methods of treatment (prisons, reformatories, parole, probation); the juvenile offender; juvenile courts; preventive methods. Three credits. TODD.

108. THE PHILIPPINE PEOPLE. Comparative study of the four large ethnic and cultural groups of people in the Philippine Islands; policy of the insular civil government as it affects American home interests in the Orient. Lectures, readings, and essay. Sociology 1 and 5. Three credits. JENKS.

110. PHYSICAL ANTHROPOLOGY. Theory of evolution as applied to natural and cultural man; theory of eugenics and its application. Prerequisites, Course 1, 5 or Course 1-2 in Animal Biology, and one other course in this department. Three credits. JENKS.

112. THE AMERICAN NEGRO. The negro in Africa; development of the American negro; present characteristics, conditions, developing tendencies, and probable future of the American negro. Lectures, readings, and essay. Sociology 1 or 3, 12 or 113. Three credits. JENKS.

113. THE AMERICAN PEOPLE. Dominant characteristics of the diverse foreign peoples now in the United States; their modification in America; the importance of these peoples to the American nation. Lectures, readings, and essay. Sociology 1 or 3, and one other course. Three credits. JENKS.

114. THE AMERICAN PEOPLE (Continued). A continuation of Course 113. Essential and unique historical Americanisms, and their value and virility for the future; facts and forces of amalgamation and assimilation in America; America's ethnic problems. Lectures, readings, and essay. Sociology 1 or 3, 113, and one other course. Three credits. JENKS.

117. SOCIAL PSYCHOLOGY. An introduction to the study of the reciprocal influence of minds in society upon one another. Prerequisites: Course 3 and one other course, and Course 1-2 or 5 in the department of Philosophy and Psychology. Three credits. PETERSON.

119. THE FAMILY. The evolution of the family; its various forms and their relation to other social institutions; the service of the family in social evolution; contemporary problems of the family (standards of living, birth rate, feminism, etc.). Three credits. TODD.

120. SOCIAL PROGRESS. An analysis of fundamental social institutions in their relation to human progress. TODD.

123. PROBLEMS IN ANTHROPOLOGY. An advanced course of method and independent research. Three credits. JENKS.

201-202. RESEARCH IN SOCIOLOGY. An advanced course of method and independent research. Two hours. TODD.

204. SEMINAR IN ANTHROPOLOGY. Individually directed research. One, two, or three hours. JENKS.

## SOILS

Professor FREDERICK J. ALWAY; Associate Professor.....; Instructor PAUL R. MCMILLER.

*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. Those students who have not had courses in the elements of geology and mineralogy will be expected to take Geology 1 and 21 during their first year of graduate work. A reading knowledge of French and 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.

101a,b. MECHANICAL ANALYSIS OF SOILS. A laboratory course on the methods of mechanical analysis. Two afternoons a week. Two credits. MCMILLER.

102. CHEMICAL ANALYSIS OF SOILS. A laboratory course on the quantitative determination of the most important soil constituents. Three credits. .....

104. SOIL CHEMISTRY. A laboratory course on the chemical examination of soils including peat and alkali soils. A more advanced course than 103. Five credits. .....

105-106. SPECIAL SOIL PROBLEMS. Individual work in laboratory, greenhouse, or field upon some special problem in soil physics or soil management. Open to graduates, but only to such undergraduates as have demonstrated their special fitness for such work. *Arrangements must be made in advance.* The problems selected are simpler than those dealt with in 201 and 202. Three to five credits, according to work. ALWAY.

201-202. 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 agron-

omy, botany, chemistry, geology, and physics. Credit according to work. ALWAY.

203-204. SEMINAR IN SOILS. Review of current literature; presentation and discussion of papers on research; study of methods of investigation of soils. Once a week. Required of graduate students. No credit. ALWAY.

205-206. CLASSIFICATION OF SOILS. A study of the various systems of classification which have been proposed. Individual work with assigned readings and conferences. Open only to those graduates of the department who have a reading acquaintance with French and German. Three credits. ALWAY.

## STRUCTURAL ENGINEERING

Associate Professor JOHN I. PARCEL; Assistant Professors FRANKLIN R. MCMILLAN, GEORGE A. MANEY.

### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

*Prerequisites.* For major or minor work, the completion of senior work in structural engineering.

155. STRUCTURAL DESIGN. The complete detail design of a pin-connected steel railway bridge truss, with a study of specifications, office designing methods, etc. Three times per week. Three credits. PARCEL.

156. STRUCTURAL DESIGN. A study of some of the more important features in the design of cantilever and arch bridges, large steel frame buildings, etc. Three times per week. Three credits. PARCEL.

157. ADVANCED THEORY OF STRUCTURES. Introductory course in deflections and indeterminate stresses. Fundamental theory and method of application to some of the more important statically indeterminate problems such as continuous bridges, arches, and secondary stresses. First semester; three times a week; lectures, recitations, and problems. Prerequisite: senior structural work. Three credits. PARCEL.

158. ADVANCED THEORY OF STRUCTURES. A problem course to follow 157. Complete analysis of two-span swing bridge; computation of the secondary stresses in a typical bridge truss; wind stresses in a steel frame office building; design of reinforced concrete arch. Second semester, three times a week; lectures and drafting room exercises. Prerequisite: Civil Engineering 157. Three credits. PARCEL, MCMILLAN.

159. PRINCIPLES OF REINFORCED CONCRETE CONSTRUCTION. Theory of reinforced concrete beams, slabs and columns; study of test data; applications in design. First semester, three meetings per week, lectures and recitations. Prerequisite: junior mechanics. Three credits. MCMILLAN.

160. REINFORCED CONCRETE DESIGN. Design of reinforced concrete buildings, retaining walls, foundations, abutments and viaducts. Second semester, three meetings per week, lectures and drafting periods. Prerequisite: junior mechanics. Three credits. MCMILLAN.

PRIMARILY FOR GRADUATE STUDENTS

201-202. THEORY OF STATICALLY INDETERMINATE STRUCTURES. A detailed critical study of the fundamental theory; comparison of methods of attack; investigation of some of the more difficult problems in arches, suspension bridges, multiple redundant frames, secondary stresses, etc. Both semesters, twice a week, lectures, assigned readings, and investigation of individual problems. Prerequisite: Civil Engineering 158. A reading knowledge of German and French is very desirable. Three to five credits. PARCEL, MANEY.

203. REINFORCED CONCRETE ANALYSIS. For those who have had equivalent of C. E. 157. Review of literature of reinforced concrete, study of test data, and analysis of stresses in reinforced concrete structures. One or two semesters, twice a week. Three credits. MCMILLAN.

## SURGERY

(Including General Surgery, Experimental Surgery, Orthopedic and Genito-Urinary Divisions.)

Professors WILLIAM F. BRAASCH, ARTHUR J. GILLETTE, CHARLES H. MAYO, JAMES E. MOORE; Associate Professors EMIL H. BECKMAN, J. FRANK CORBETT, MELVIN S. HENDERSON, EDWARD S. LUDD, ARTHUR A. LAW; Assistant Professors EMIL S. GEIST, FRANK C. MANN, SAMUEL ROBINSON, WALTER E. SISTRUNK, ARTHUR C. STRACHAUER.

Dr. William J. Mayo, being a regent of the University, is not a member of the instructional staff. His services in instruction and consultation, however, are available.

For courses of study offered, see special bulletin of Graduate Work in Medicine.

## VETERINARY MEDICINE

Professor MYRON H. REYNOLDS.

*Prerequisites.* For major work, twelve credits; for minor work, six credits in the department.

201-202. PROBLEMS IN ANIMAL SANITATION. Losses to animal husbandry from disease. Causes and prevention of such losses. Organization of sanitary control work. REYNOLDS.

203-204. PROBLEMS IN PHYSIOLOGIC AND HISTOLOGIC FEATURES OF ANIMAL NUTRITION. Includes especially juices involved in the processes of nutrition.

# Bulletin of The University of Minnesota

# THE COLLEGE OF FORESTRY

## 1916-1917

VOL. XIX. NO. 15. JULY 1916

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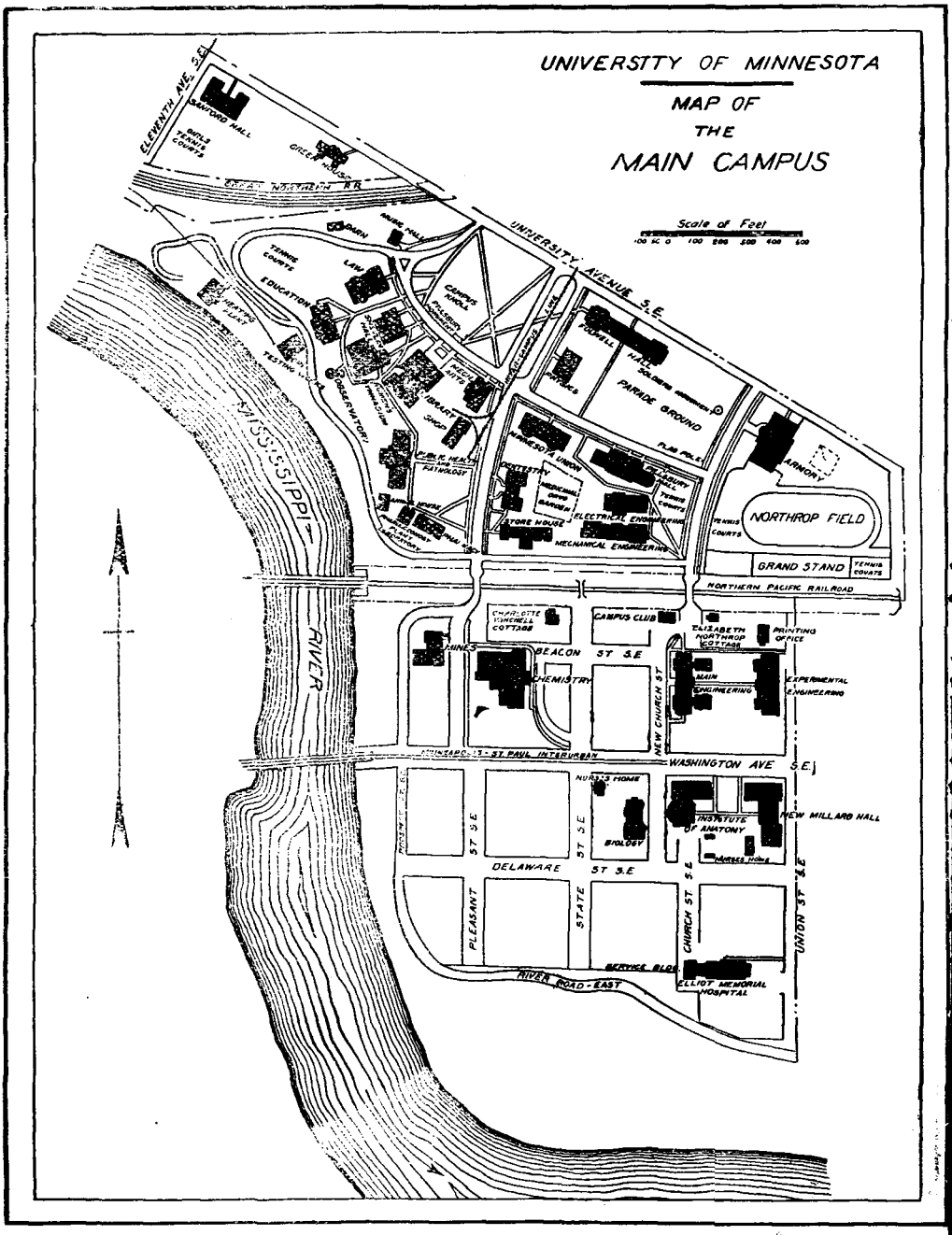
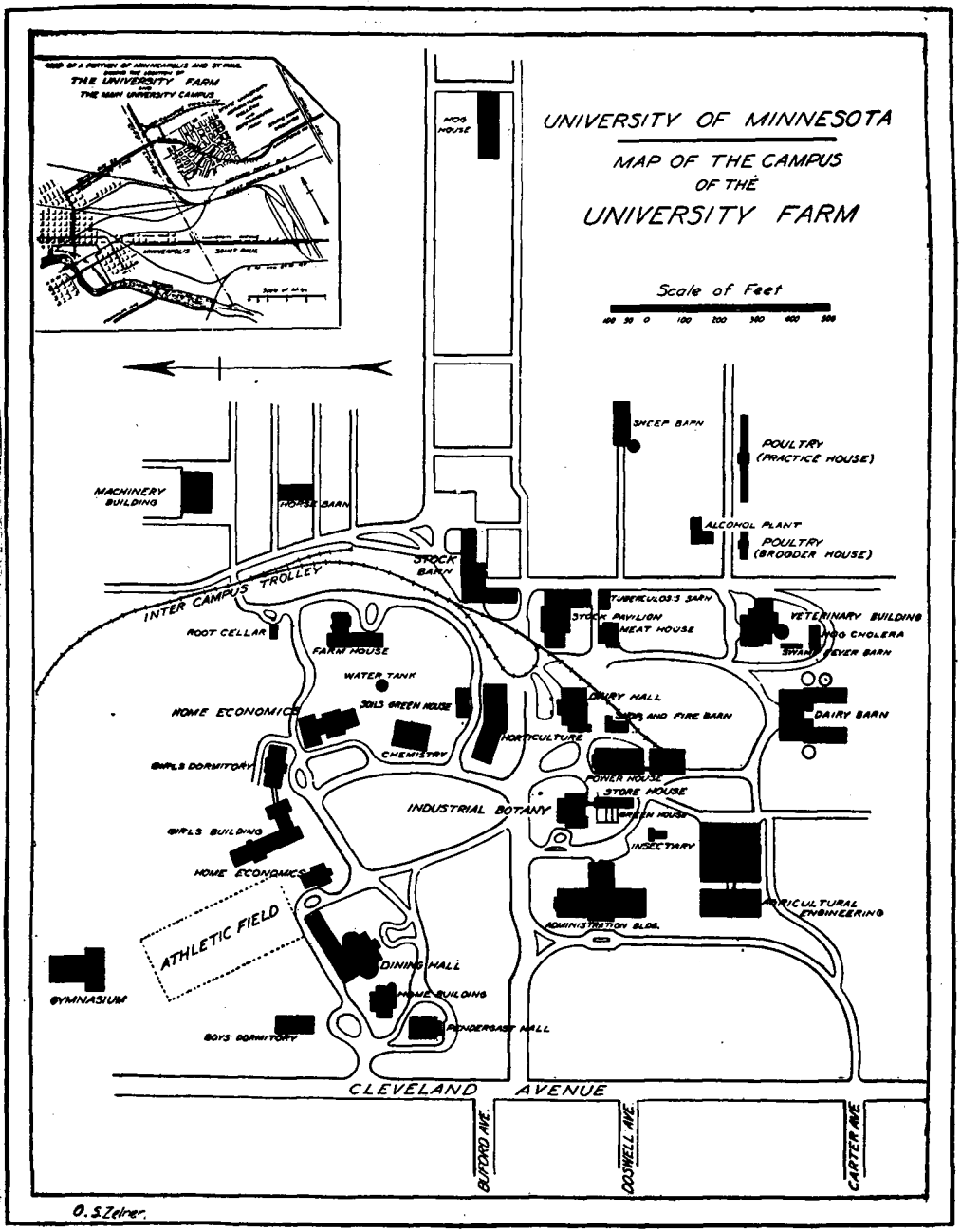



Area of Main Campus, 108.5 acres




Area of University Farm, 422.56 acres

## 1916

### JULY

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## 1917

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### JULY

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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# CALENDAR

## COLLEGE OF FORESTRY

### 1916-1917

The University year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

| | | | |
|---|---|---|---|
| 1916 | | | |
| September | 13 | Wednesday | Registration closes except for new students |
| September | 13-20 | Week | Fees payable except for new students |
| September | 19-26 | Week | Entrance examinations, registration of new students, and payment of fees |
| September | 27 | Wednesday | First semester begins |
| October | 5 | Thursday | Senate meeting, 4:00 p.m. |
| November | 7 | Tuesday | Election day; a holiday |
| November | 29 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 4 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 4-9 | Week | Second semester condition examinations |
| December | 7 | Thursday | Senate meeting, 4:00 p.m. |
| December | 22 | Friday | Christmas vacation begins 9:00 p.m. |
| 1917 | | | |
| January | 3 | Wednesday | Christmas vacation ends 8:00 a.m. Senior field work begins |
| January | 24 | Wednesday | Second semester registration closes, except for new students |
| January | 29 | Monday | Final examinations begin |
| February | 1 | Thursday | Senate meeting, 4:00 p.m. |
| February | 6 | Tuesday | Registration and payment of fees for second semester closes. All grades for first semester due in Secretary's office |
| February | 7 | Wednesday | Second semester begins. Senior field work in lumbering closes |
| February | 22 | Thursday | Lincoln's Birthday; a holiday |
| February | 12 | Monday | Washington's Birthday; a holiday |
| April | 5 | Thursday | Easter recess begins 9:00 p.m. |
| April | 11 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 16-21 | Week | First semester condition examinations |
| April | 27 | Friday | Junior work at Itasca Park begins |
| May | 3 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Wednesday | Memorial Day; a holiday |
| June | 1 | Friday | Final examinations begin 2:00 p.m. |
| June | 9 | Saturday | Second semester closes |
| June | 10 | Sunday | Baccalaureate service |

| | | | |
|---|---|---|---|
| June | 11 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 13 | Wednesday | Alumni Day |
| June | 14 | Thursday | Forty-fifth Annual Commencement |
| June | 15 | Friday | Summer vacation begins |
| June | 19 | Wednesday | Freshman work at Itasca Park begins |
| August | 11 | Saturday | Freshman work at Itasca Park closes |
| August | 25 | Saturday | Junior work at Itasca Park closes |

The University year for 1917-1918 will begin Tuesday, September 18.

# THE COLLEGE OF FORESTRY

## FACULTY

GEORGE E. VINCENT, Ph.D., LL.D., President
1005 5th St. S. E., Minneapolis
CYRUS NORTHROP, LL.D., President Emeritus
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2163 Carter Ave., St. Paul
RODNEY M. WEST, B.A., Secretary 2141 Doswell Ave., St. Paul
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In charge Forest Experiment Station, Cloquet, Minn.
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Forest Experiment Station, Cloquet, Minn.
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1540 Lincoln Ave., St. Paul
JULIUS V. HOFMANN, M.F., Ph.D., Special Lecturer on Sylviculture
2089 Carter Ave., St. Paul
DILLON P. TIERNEY, M.F., Assistant State Forester, Special Lecturer
State Capitol, St. Paul

## MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION IN THE COLLEGE OF FORESTRY

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712 7th St. S. E., Minneapolis
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723 7th St. S. E., Minneapolis
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2227 Knapp St., St. Paul
ROY G. BLAKEY, Ph.D., Assistant Professor of Economics
112 Church St. S. E., Minneapolis
LEROY CADY, B.S. in Agr., Associate Professor of Horticulture
2121 Doswell Ave., St. Paul

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508 5th Ave. S. E., Minneapolis
IRA H. DERBY, Ph.D., Assistant Professor of Chemistry
2157 Commonwealth Ave., St. Paul
HAL DOWNEY, Ph.D., Associate Professor of Animal Biology
802 4th St. S. E., Minneapolis
E. DANA DURAND, Ph.D., Professor of Economics
629 5th St. S. E., Minneapolis
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630 7th St. S. E., Minneapolis
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412 Walnut St. S. E., Minneapolis
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1219 7th St. S. E., Minneapolis
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East Sanford Hall, Minneapolis
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Charlotte Winchell Cottage, Minneapolis
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737 7th St. S. E., Minneapolis
PERCIVAL W. VIESSELMAN, LL.B., M.A., Assistant in Political Science
401 Oak St. S. E., Minneapolis

## FACULTY COMMITTEES

1916-17

*Executive Committee.*—Dean, Secretary, Chiefs of Divisions
*Enrollment.*—WEST, MOWRY, BIESTER, WENTLING, BENDER, PIERCE
*Curriculum and Catalog.*—CHEYNEY, WENTLING, ALLISON

*Program.*—STEWART, MOWRY, WILLIAMS
*Students' Work.*—FREEMAN, WEST, BERRY, CHEYNEY, SWEENEY, RUGGLES
*Library.*—ALWAY, WELLINGTON, STAKMAN, SEWALL, LANSING, HOWARD
*Research.*—THATCHER, FREEMAN, DORSEY, ALWAY, STAKMAN, HAYES
*Student Organizations.*—LANSING, BERRY, CHEYNEY, WELLER, FREEMAN
*Athletics.*—OSWALD, MONTGOMERY, BOYD, CHEYNEY, PECK
*Demonstration and Exhibit.*—R. M. WASHBURN, C. P. BULL, ALLISON, TRILLING, SMITH, JAGER, MACKINTOSH, F. L. WASHBURN
*Sanitation.*—REYNOLDS, MAYNE, WHEELER, C. W. HOWARD, LAUE
*Grounds.*—BOSS, CADY, STEWART, OSWALD
*Genetics.*—DORSEY, HAYES, SMITH, STAKMAN
*Short Course.*—STORM, MAYNE, R. M. WASHBURN, BRIERLEY, BERRY, STEWART, BOSS, KIRKWOOD, WEST
*Auditing.*—ROE, PECK, LUSK
*Publications.*—WILSON, BOSS, HAECKER, FREEMAN, THATCHER
*Faculty Business.*—LUSK, MOORE, CHEYNEY, WHEELER
*Delayed English Credit.*—LANSING, GLICK, MOHL, COOK
*Appointment.*—STORM, BERRY, GEHRAND, ARNY

# GENERAL INFORMATION

## ADMISSION

*Credentials.*—All students upon entering for the first time shall submit their credentials to the Enrollment Committee.

Admission is either by certificate or by examination. Candidates must have completed the equivalent of a four-year high school course and must present:

1. Four units of English; or three units of English and four units of a foreign language; or three units of English and two units in each of two foreign languages.
2. One unit of Algebra and one unit of Plane Geometry.
3. Enough additional work to make in all fifteen units, of which not more than four may be in vocational subjects.

A detailed statement of admission requirements may be found in the Bulletin of General Information.

All students desiring to enter the Forestry courses are urged to present Physics and Chemistry for entrance credits.

## FEES

| | |
|---|---|
| Incidental semester fee | |
| Residents of Minnesota | $20.00 |
| Non-residents | 40.00 |
| Deposit (for the year) | 5.00 |
| Military deposit (freshmen or sophomores, on first registering) | 15.00 |
| Gymnasium (per semester) | 1.50 |
| Men's Union (per semester) | 1.00 |
| Itasca Park fee; freshman year | 3.00 |
| junior year | 5.00 |
| Special fees | |
| Examination for removal of condition | 1.00 |
| Examination for credit (after the first semester in residence) | 5.00 |
| Special examination | 5.00 |
| Change of registration | 2.50 |

*Late registration.*—Old students must indicate their registration not later than two weeks before the day set for classes to begin. All students must complete their registration (including payment of fees) before the day set for classes to begin. Penalty for delay in either indicating or completing registration, one dollar. An additional twenty-five cents is charged for each day of delay after the last day set for the completion of registration, and a similar charge for each day of delay after the last day set for payment of fees.

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

## REQUIREMENTS FOR GRADUATION AND DEGREE

After the completion of the prescribed course of study, including all of the required work and the requisite amount of elective work equivalent to 157 credit hours, candidates will be recommended for graduation with the degree of Bachelor of Science. The diploma will designate the College of Forestry and the candidate's major line of work.

## FACULTY REGULATIONS

The regulations of the Faculty are published in a separate booklet which will be issued at the time of registration. Students are held responsible for compliance with all of these regulations.

# COURSES OF STUDY

There are at the present time three specialized branches of work open to forestry students. The curricula for the freshman year are the same, and for the sophomore year nearly the same for all three branches. By the end of the first year the student should be able to decide which of the three prescribed specialized courses he intends to follow for the remaining three years. These courses are distinct, and a change after the sophomore year can not be made without loss of credits.

It is important that the line of specialization be selected with great care, since the student's interest in and aptitude for his work is of prime importance. The choice should not be made without first consulting with some member of the faculty.

1. Technical Forestry Course. This course has for its object a thoro training in the management of growing forests. Particular emphasis is given to the training for experimental and research work. It includes all the technical forestry courses, together with such allied courses as may aid in their application.

2. Commercial Lumbering. This course is a preparation for the lumber business. It includes such technical forestry courses as are needed in the handling of timber crops and a very thoro series of courses in economics and business methods.

3. Wood Pulp and Distillation. This course is intended to prepare men to serve the industries which utilize wood pulp and all the products of wood other than lumber. It includes the necessary technical forestry courses and a complete series of work in chemistry and the technology of wood.

## GROUP A

## GENERAL REQUIREMENTS FOR ALL STUDENTS IN FORESTRY

### EXPLANATION OF COURSE NUMBERS

Odd numbers indicate first-semester courses; even numbers, second semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. In the case of courses repeated the second semester, the suffix *a* indicates first semester; the suffix *b*, second semester.

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.

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 semester.

## FRESHMAN YEAR

*First Semester*

*Agr. Eng. 1a, Higher Algebra, 3
Bot. 1a, General Botany, 3
Rhet. 1a, Rhetoric, 3
For. 1, General Forestry, 3
†Chem. 33, General Chemistry and Qualitative Analysis, 5
or
Chem. 3a, Advanced General Chemistry and Qualitative Analysis, 3
and
‡Econ. 1a, Industrial History since 1750, 3
or
‡Econ. 2a, Industries and Commerce of U. S., 3
Mil. Sci. 1, Military Drill

**Hygiene
††Freshman Lectures

*Second Semester*

Agr. Eng. 2b, Plane Trigonometry, 3
Bot. 2, Structural Botany, 3
Rhet. 2, Rhetoric, 3
For. 2, Dendrology, 2
Hort. 56, Plant Propagation, 1
Chem. 4b, Advanced General Chemistry and Qualitative Analysis, 3
‡Econ. 1b, Industrial History since 1750, 3
or
‡Econ. ab, Industries and Commerce of the U. S., 3
or
Elective, 3
Mil. Sci. 2, Military Drill
Itasca Park, June and July
Freshman Woods Work, 8

## SOPHOMORE YEAR

*First Semester*

Agr. Eng. 3a, Mechanical Drawing, 3
Rhet. 11, Argumentation, 3
An. Biol. 3, General Zoology, 3
For. 5, Dendrology, 3
Econ. 3a, Principles of Economics, 3
Mil. Sci. 3, Military Drill
Special requirements from Group B, 3

*Second Semester*

Agr. Eng. 12, Forest Engineering, 3
Rhet. 12, Argumentation, 3
An. Biol. 4, General Zoology, 3
Pl. Path. and Bot. 10, Forest Pathology, 3
Mil. Sci. 4, Military Drill
Special requirements from Group B, 6

## JUNIOR YEAR

*First Semester*

For. 31, Sylviculture, 3
Econ. Zool. 5, Forest Entomology, 3
For. 37, Wood Technology, 3
Special requirements from Group B, 9

*Second Semester*

For. 32, Sylviculture, 2
Special requirements from Group B, 8
Itasca Park, April-September
For. 34, Sylviculture, 4.
For. 14, Mensuration, 4
Agr. Eng. 14, Forest Engineering, 3
Pl. Path. and Bot. 8, Dendropathology, 1
Econ. Zool. 6, Forest Entomology, 1

* Not required of those who present Higher Algebra for admission.

† Required of those who do not present high school chemistry (1 unit) for admission. An additional credit must be completed before graduation.

‡ Econ. 1 or 2 must be taken the first year.

§ Not offered in 1916-17.

** All freshmen of the University are required to take a no-credit course of twelve lectures in Hygiene.

†† A course of lectures intended primarily to familiarize the new student with the college, college customs and methods of procedure is required of all freshmen.

## SENIOR YEAR

*First Semester*

Pol. Sci. 51, Business Law, 2
For. 17, Forest Management, 3
For. 15, Lumbering, 6
For. 35, Wood Preservation, 1
§Econ. 15, Forest Economics and Conservation, 2
Public Health Lectures
Special requirements from Group B, 4

*Second Semester*

For. 18, Forest Management, 2
For. 10, Forest Protection, 2
Special requirements from Group B, 14

§ Not offered in 1916-17.

## GROUP B

### Special Requirements in the Different Courses of Study

Students are expected to supplement Group A, as indicated, from one line of specialization exclusively.

| Year and Semester | Technical Forestry | Commercial Lumbering | Wood Pulp and Distillation Products |
|---|---|---|---|
| Sophomore First Sem. | *Elective, 3 | Econ. 35, Accounting Principles, 3 | Chem. 35, Organic Chemistry, 3 |
| Sophomore Second Sem. | *Elective, 3<br>*Geol. 2, Geology, 3 | Pol. Sci. 1b, American Government, 3<br>Econ. 36, Accounting Principles, 3 | Chem. 36, Organic Chemistry, 3<br>Econ. 43b, Banking, 3 |
| Junior First Sem. | Geol. 33, Physiography, 3<br>Bot. 101, Applied Ecology, 3<br>Hort. 71, Landscape Gardening, 3 | Econ. 43a, Banking, 3<br>Econ. 161, Labor Problems, 3 or<br>Econ. 191, Public Finance, 3<br>Econ. 37, Marketing of Products, 3 | Chem. 11, Quantitative Analysis, 4<br>Chem. 121, Physical Chemistry, 2<br>For. 103, Uses of Wood, 3 |
| Junior Second Sem. | Agr. Eng. 6, Forest Mechanics, 2<br>Econ. Zool. 12, Forest Zoology, 2<br>Vet. Sci. 16, Veterinary Medicine, 2<br>Bot. 102, Applied Ecology, 2 | Agr. Eng. 6, Forest Mechanics, 2<br>Econ. Zool. 12, Forest Zoology, 2<br>For. 38, Wood Technology, 2<br>Econ. 34, Business Management, 2 | For. 38, Wood Technology, 2<br>Chem. 12, Quantitative Analysis, 4<br>Chem. 122, Physical Chemistry, 2 |
| Senior First Sem. | For. 23, Forest By-Products, 2<br>Elective, 3 | For. 23, Forest By-Products, 2<br>Econ. 145, Corporations, 2 | For. 23, Forest By-Products, 1<br>Chem. 155, Wood Chemistry, 3 |
| Senior Second Sem. | For. 30, Forest Seminar, 4<br>For. 24, Lumber Manufacturing, 2<br>For. 102, Experimental Sylviculture, 2<br>For. 26, Forest Working Plans, 6 | For. 24, Lumber Manufacturing, 2<br>For. 20, Logging Plans, 3<br>Econ. 38, Advertising, Salesmanship, 3<br>Econ. 122, Commercial Policies, 3<br>Econ. 146, Public Utilities, 3 | Chem. 156, Technology of Paper Pulp, 3<br>For. 16, Theses, 7<br>Econ. Zool. 12, Forest Zoology, 2<br>Agr. Eng. 6, Forest Mechanics, 2 |

* If it is desired to elect beginning modern language, Economics 3 and Geology 2 may be postponed until later in the course.

# DEPARTMENTAL STATEMENTS

For explanation of course numbers and credits see page 14.

## FORESTRY

Professors EDWARD G. CHEYNEY, JOHN ALLISON; Associate Professor JOHN P. WENTLING; Assistant Professor WILLIAM H. KENETY; Instructor GILBERT H. WIGGIN; Special Lecturers WILLIAM T. COX, JULIUS V. HOFMANN, DILLON P. TIERNEY.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Forestry | 3 | Fr. | None |
| 2. | Dendrology | 2 | Fr., soph. | Bot. 1 |
| 5. | Dendrology | 3 | Fr., soph. | 2 |
| †6. | Elementary Sylviculture | 4 | Fr. | Bot. 2 |
| 10. | Forest Protection | 2 | Jr., sr. | 5 |
| †12. | Elementary Mensuration | 4 | Fr. | None |
| †14. | Forest Mensuration | 4 | Jr. | 5 |
| 15. | Lumbering | 6 | Sr. | 1, 5 |
| 16. | Thesis | 7 | Sr. | 37-38, Chem. 155 |
| ‡17. | Forest Management | 3 | Sr. | 14, 15, 34 |
| 18. | Forest Management | 2 | Sr. | 17 |
| 20. | Logging Plans | 3 | Jr., sr. | 15 |
| ‡23. | Forest By-Products | 2** | Jr., sr. | None |
| 24. | Lumber Manufacturing | 2 | Jr., sr. | 1, 37-38 |
| 26. | Forest Working Plans | 6 | Sr. | 1, 17 |
| 30. | Forest Seminar | 4 | Sr. | 17 |
| 31. | Sylviculture | 3 | Jr. | 1, 5, Bot. 2 |
| 32. | Sylviculture | 2 | Jr. | 31 |
| †34. | Sylviculture | 4 | Jr. | 32 |
| *35. | Wood Preservation | 1 | Jr. | 37-38 |
| 37-38. | Wood Technology | 5 | Soph., jr., sr. | Bot. 1 yr. |
| | *Advanced Courses* | | | |
| 101. | Advanced Dendrology | 3 | Jr., sr. | 5, Bot. 6 cr. |
| 102. | Experimental Sylviculture | 2 | Sr. | 34 |
| 103. | Uses of Wood | 3 | Jr., sr. | 5 |

* This course continues only six weeks, 3 hours per week.
† Given in summer at Itasca.
‡ These courses are concluded at the beginning of the Christmas vacation.
** One credit given for completion of half the course.

### INTRODUCTORY COURSES

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. CHEYNEY.

2. DENDROLOGY. Comprehensive study of the forest trees of the United States; their classification, characteristics, range, etc., with special attention to prominent and constant characteristics. Lectures, assigned reading, special papers, field work. WENTLING.

5. DENDROLOGY. Continuation of Course 2.

6. ELEMENTARY SYLVICULTURE. Largely field work designed to give the student a working knowledge of the forest. It includes dendrological study of the species found in the north woods and the general principles of underlying reconnaissance. WENTLING.

10. FOREST PROTECTION. Consideration of practical measures for the protection of forests from fires, trespass, and grazing. State and Federal forest-fire and trespass laws. Insects and fungi are taken care of in special courses. ALLISON.

12. ELEMENTARY MENSURATION. This course is largely field work. It includes elementary work in timber cruising, valuation surveys, stem analysis, and the study of the measurements of stand, volume, and yield. ALLISON.

14. FOREST MENSURATION. The measurement of lumber and of logs by different units; of volume, growth, and yield; of individual trees and stands. Cruising, the formation of log rules, stand, height, volume and yield tables. ALLISON.

15. LUMBERING. This course is designed to give the student a clear, balanced view of the lumber industry, especially logging. A month's work in a lumber camp in the senior year with a full report is required. CHEYNEY.

16. THESIS. A comprehensive study of an assigned problem for the laboratory or the manufacturing field. The preliminary work to be done in the first ten weeks, with full time intensive study for the remainder of the semester. ALLISON.

17. FOREST MANAGEMENT. Policy of forest owners; principles of governing all forest management; forest valuation; the calculation of soil rent, forest rent, and the value of growing stock; the values of even and uneven-aged stands. Working plans. ALLISON.

18. FOREST MANAGEMENT. Continuation of Course 17.

20. LOGGING PLANS. A study of the data essential to the preparation of a logging plan, a plan for a definite operation. The organization of crews and companies. CHEYNEY.

23. FOREST BY-PRODUCTS. A special study of forest products other than timber. Cellulose for paper, sugar, tanning materials, turpentine, tar, oil, resin, waxes, gum, creosote, wood alcohol, acetic acid, and acetone. ALLISON.

24. LUMBER MANUFACTURING. A study of sawmills and sawmill machinery, and other processes in the primary manufacture of wood, the

general principles and the purpose of grading lumber. A brief study of the lumber market. CHEYNEY.

26. FOREST WORKING PLANS. The principles of working plans. Each class will be required to work out a complete plan including surveys, sylviculture plans, estimates, field tables, maps and systems of management. ALLISON.

30. SEMINAR. This is not a class for the prosecution of original research, but for the purpose of systematically reviewing the whole field of forestry and studying the concrete application of the different branches. CHEYNEY, WENTLING, ALLISON.

31. SYLVICULTURE. Study of the fundamental principles forming the basis of sylviculture. Forest types. Special attention to the sylvics of the important species. Lectures and laboratory. WENTLING.

32. SYLVICULTURE. Sylvicultural systems. WENTLING.

34. SYLVICULTURE. Nursery work and planting. Lectures, reading, and field work. WENTLING.

35. WOOD PRESERVATION. Lectures and collateral reading upon the history, development, and methods of wood preservation. Different systems now in use and preservatives used. ALLISON.

37-38. WOOD TECHNOLOGY. A comprehensive study of the structure of important woods, especially of the United States. Special emphasis on the identification, classification, and histology. A study of physical characteristics of wood and their effect on its utilization. WENTLING.

## ADVANCED COURSES

101. ADVANCED DENDROLOGY. A continuation of courses 2 and 5 with special studies in classification and distribution. WENTLING.

102. EXPERIMENTAL SYLVICULTURE. A study of fundamental principles of sylviculture which are broadly applicable, as well as methods used at forest experiment stations in solving problems in forestration, management, protection, and mensuration. KENETY.

103. USES OF WOOD. A thoro study of the woods used by the various wood-using industries. Woods for special uses, fancy woods, cabinet woods, wood substitutes. CHEYNEY, WENTLING.

# COURSES IN OTHER SCHOOLS AND COLLEGES

The following courses are offered to students in the College of Forestry by departments of other schools and colleges of the University. For complete lists and descriptions of courses offered by these departments, see the bulletins of the several schools and colleges.

## AGRICULTURAL ENGINEERING

### COLLEGE OF AGRICULTURE

Professor JOHN T. STEWART; Assistant Professor HARRY B. ROE; Instructors ALLEN D. JOHNSTON, HALL B. WHITE, LLOYD R. WHITSON.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Higher Algebra | 3 | Fr. | None |
| 2a,b. | Plane Trigonometry | 3 | Fr. | Higher Algebra |
| 3a,b. | Mechanical Drawing | 3 | Soph. | None |
| 6. | Forest Mechanics | 2 | Jr. | None |
| 12. | Forest Engineering | 3 | Soph. | 2 and 3 |
| *14. | Forest Engineering | 3 | Jr. | 12 |

* Given at Itasca.

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

### INTRODUCTORY COURSES

1a,b. HIGHER ALGEBRA. Special attention is given to practical problems, the methods of computation, and a foundation for Plane Trigonometry. ROE.

2a,b. PLANE TRIGONOMETRY. Theory and use of logarithms and a study of the functions of Plane Trigonometry with numerous practical applications. ROE.

3a,b. MECHANICAL DRAWING. Lectures on drawing, exercises in the use of drawing instruments, lettering, and water colors. The making of working drawings with their practical value. WHITSON.

6. FOREST MECHANICS. Blacksmithing: practice work in the handling of forge and anvil; the bending, shaping, and welding of steel. Carpentry; practice work in the use and care of tools used in lumbering. JOHNSTON, WHITE.

12. FOREST ENGINEERING. Methods of making original land surveys, study of topographic symbols and the elements of topographic drawing. General principles of surveying. STEWART.

14. FOREST ENGINEERING. Field practice and mensuration, surveying and topography. STEWART.

## ANIMAL BIOLOGY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor HENRY F. NACHTRIEB; Associate Professor HAL DOWNEY; Instructor GEORGE D. ALLEN; Assistant ADOLPH RINGOEN.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3-4. | General Zoology | 6* | All | None |
| 7-8. | Histology and Embryology | 6* | Soph., jr., sr. | 3-4 |

* Both semesters must be completed before credit is given.

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

### INTRODUCTORY COURSES

3-4. GENERAL ZOOLOGY. A survey of the animal kingdom emphasizing the principles of development and structure in relation to function and habit, heredity and evolution and animals of economic importance. Lectures, quizzes, and laboratory. NACHTRIEB, ALLEN, RINGOEN.

7-8. HISTOLOGY AND EMBRYOLOGY. A comparative microscopic study of the origin and structure of the tissues of vertebrates and invertebrates, and of the organs of mammals. Textbook, lectures, and laboratory. DOWNEY.

## BOTANY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors FREDERICK E. CLEMENTS, CARL OTTO ROSENDAHL, JOSEPHINE E. TILDEN; Assistant Professors HERBERT F. BERGMAN, NED L. HUFF; Instructor WILLIAM S. COOPER; Assistants DONALD FOLSOM, FRANCES L. LONG, HARVEY STALLARD.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | General Botany | 3 | All | None |
| 2. | Structural Botany | 3 | All | 1 or 3 |
| 3a,b. | Evolution of Plants | 3 | All | 1 or equiv. |
| 4. | Field and Garden Botany | 3 | All | 1 or 3 |
| | *Intermediate Courses* | | | |
| 5-6. | Plant Morphology | 3 or 6 | Soph., jr., sr. | 6 cred.; see note under course |
| 7-8. | Taxonomy | 3 or 6 | Soph., jr., sr. | 6 cred.; see note under course |
| 9-10. | Physiology and Ecology | 3 or 6 | Soph., jr., sr. | 6 cred. |
| | *Advanced Courses* | | | |
| 101-102. | Applied Ecology | 3 or 6 | Jr., sr. | 12 cred. |

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

## INTRODUCTORY COURSES

1a,b. General Botany. A study of the external form and organs of flowering plants, root, stem, leaf, fruit, and seed and of their relations to each other, together with simple greenhouse experiments to illustrate the various functions. Clements, Huff, Bergman, Cooper, Folsom, Long, Stallard.

2. Structural Botany. A study of the microscopic structure of flowering plants, the cell, tissues, and tissue systems, as seen in the root, stem, leaf, etc. Huff, Stallard.

3a,b. Evolution of Plants. A comparative study of selected types of plants, illustrating the evolution of land plants from the simplest forms. Tilden, Huff.

4. Field and Garden Botany. Greenhouse, garden, and field study of the form, behavior, naming, and relationships of flowering plants, together with individual problems in the pollination, reproduction, and propagation of common flower types. Clements, Bergman, Folsom, Long, Stallard.

## INTERMEDIATE COURSES

Either semester of the following courses open to students with the proper requisites.

5-6. Plant Morphology. A comparative study of the form, structure, and life history of typical algae, fungi, liverworts, mosses, ferns, and seed plants. Course 6 (but not 5) open to those who have taken Course 3. .....

7-8. Taxonomy. A general study of the classification and relationships of flowering plants. Laboratory and field practice in the determination of species, together with lectures and quizzes. Course 8 (but not 7) open to those who have taken Course 4. Rosendahl.

9-10. Physiology and Ecology. Greenhouse and field study of physical factors and plant responses, absorption, transport, water loss, nutrition, growth, fertilization, reproduction, and adaptation; field study of habitat, migration, competition, invasion, and succession. Clements, Cooper.

## ADVANCED COURSES

101-102. Applied Ecology. A study of the physiological and the ecological principles and methods involved in the production of field, garden, and forest crops. Either semester open to students who have had introductory botany and physiology and ecology. Clements.

# CHEMISTRY

## SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

Professors GOERGE B. FRANKFORTER, CHARLES F. SIDENER; Assistant Professor IRA H. DERBY; Instructors ROSS A. BAKER, WOLF KRITCHEVSKY, WOLDEMAR M. STERNBERG, STERLING TEMPLE, H. LEE WARD.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3a,b-4a,b. | Adv. General Chem. and Qual. Analysis | 6† | Fr., soph., jr. | Ent. cred. in Chem. |
| 11-12. | Quantitative Analysis | 8† | Soph., jr., sr. | 3-4 |
| ‡33. | General Chem. and Qual. Anal. | 5 | Fr., soph., jr. | None |
| 35-36. | Organic Chemistry | 8†* | Jr., sr. | 3-4 |
| | *Advanced Courses* | | | |
| 121-122. | Physical Chemistry | 4 | Jr., sr. | 35-36 |
| 155. | Wood Chemistry | 3 | Jr., sr. | 35-36 |
| 156. | Technology of Paper Pulp | 3 | Jr., sr. | 155 |

* Forestry students are allowed 6 credits for completion of three-fourths of the course.

† Both semesters must be completed before credit is given for the first semester.

‡ Course 4b must be completed before credit is given.

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

### INTRODUCTORY COURSES

3a,b-4a,b. ADVANCED GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. Lectures, recitations, and laboratory work. General descriptive chemistry, including the fundamental theories and laws, and qualitative analysis. FRANKFORTER, WARD.

11-12. GENERAL DISCUSSION OF QUANTITATIVE METHODS, with laboratory work in gravimetric analysis, first semester, followed by a discussion of standard solutions and the necessary stoichiometric calculations, with laboratory work in volumetric analysis, second semester. SIDENER, STERNBERG.

33. GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. Designed for those who have had no high school chemistry; in preparation for Course 4b. See statement under 3a,b-4a,b. FRANKFORTER, BAKER, WARD.

35-36. ORGANIC CHEMISTRY. This course includes the aliphatic and the aromatic series with the preparation of the more important compounds. FRANKFORTER, KRITCHEVSKY.

### ADVANCED COURSES

121-122. PHYSICAL CHEMISTRY. A consideration of the theories and laws, phenomena and processes which form the basis of chemical science. Charts, models, and experiments are employed to supplement and illustrate the discussions. DERBY.

155. WOOD CHEMISTRY. The course includes a general survey of the chemistry of the carbohydrate group, special attention being given to the resins, the terpenes, cellulose, and lignocellulose. FRANKFORTER.

156. TECHNOLOGY OF PAPER PULP. Preparation of the various wood products, as pure cellulose, commercial wood, and paper. Special attention will also be given factory control of these processes. TEMPLE.

## ECONOMICS

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors JOHN H. GRAY, E. DANA DURAND; Assistant Professors ROY G. BLAKEY, J. FRANKLIN EBERSOLE; Instructors LLOYD M. CROSGRAVE, HARRY D. HARPER, ALBERT C. JAMES, ROBERT J. MCFALL.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a. | Industrial Hist. since 1750 | 3 | All | None |
| 2a. | Industries and Commerce of U. S. | 3 | All | None |
| †3a,b. | Principles of Economics | 3 | Soph., jr., sr. | 1 or 2 |
| 4a,b. | Economic Problems | 3 | Soph., jr., sr. | 3 |
| †15. | Forest Econ. and Conservation | 3 | Jr., sr. | 3 |
| 18. | Problems in Agricultural Econ. | 3 | Soph., jr., sr. | 3 |
| †34. | Business Management | 3 | Soph., jr., sr. | 3 |
| 35-36. | Accounting Principles | ‡6 | Soph., jr., sr. | None |
| 37. | Marketing of Products | 3 | Jr., sr. | 3 |
| 38. | Advertising, Salesmanship | 3 | Soph., jr., sr. | 3 |
| 43a,b. | Banking | 3 | Soph., jr., sr. | 3 |
| | *Advanced Courses* | | | |
| 122. | Commercial Policies | 3 | Soph., jr., sr. | 3 |
| †145. | Corporations | 3 | Jr., sr. | 3 |
| 146. | Public Utilities | 3 | Jr., sr. | 3, 145 |
| 161. | Labor Problems | 3 | Jr., sr. | 3 |
| 191. | Public Finance | 3 | Jr., sr. | 6 cred. incl. 3 |
| 192. | State and Local Taxation | 3 | Jr., sr. | 191 |

† Seniors in forestry taking these courses discontinue them at the Christmas vacation and are allowed 2 credits on each 3 credit course.

‡ Both semesters must be completed before credit is given for the first semester.

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

### INTRODUCTORY COURSES

1a. INDUSTRIAL HISTORY SINCE 1750. Economic effects of inventions, wars, political changes, increased supply of precious metals, improved transportation, and modifications of business organization in chief European countries and the United States. GRAY.

2a. INDUSTRIES AND COMMERCE OF THE UNITED STATES. Agricultural, mining, and manufacturing industries, internal and foreign commerce. Industries and commerce of the several sections of the country. Lead-

ing individual industries: geographical distribution, methods of reorganization, production, and marketing, and relationships to one another. McFall.

3a,b. Principles of Economics. Fundamentals of economic theory with special reference to agriculture. Cumberland.

4a,b. Economic Problems. A survey of the fundamentals in the problems of labor, social insurance, socialism, government ownership, corporations, trusts, monopolies, transportation, banking, protection, free trade, public revenues and expenditures. Blakey.

15. Forest Economics and Conservation. Development of forest policies; relation of forests to other industries; effects of transportation rates and taxation; general problem of the conservation of natural resources. Lectures, assigned readings, and reports. Not given in 1916-17. McFall.

18. Problems in Agricultural Economics. The practical economic problems which confront the farmer as a producer, consumer, and citizen; land settlement and development; size of farms; intensity of cultivation; tenancy; credit; marketing; coöperation; taxation; protective duties; foreign markets; transportation. Durand.

34. Business Management. The principles of efficiency in business operation and forms of organization to apply them; the typical departments of a business: their functions, office organization and administration. Textbook, assigned readings, and lectures. Harper.

35-36. Principles of Auditing. The purpose and principles of account classification; capital and revenue; accruals; valuation; depreciation; preparation and interpretation of balance sheets, income accounts, and other statements; corporation accounts. A laboratory course with supplementary lectures. Harper.

37. Marketing of Products. Merchandising problems of manufacturers, wholesalers, and retailers; distributing systems and market organization; price policies; sales management. James.

38. Advertising, Salesmanship, and Commercial Credit. Functions and principles of advertising; advertising media; planning and executing an advertising campaign. Principles of personal salesmanship. Problems of the Credit Department. James.

43a,b. Principles and Practice of Banking. Contemporary banking institutions, both national and state; their incorporation, organization, administration; reserves, note issues, clearing houses, domestic and foreign exchange; the banking systems of foreign countries; and the Federal Reserve Banks of the United States. Ebersole.

ADVANCED COURSES

122. Commercial Policies. Theory of international commerce; free trade, reciprocity, and protection, with special emphasis on the tariff history

and policy of the United States; commercial treaties and foreign politics. Lectures, assigned readings, and reports. BLAKEY.

145. THE MODERN BUSINESS CORPORATION. The organizing, financing, and managing of corporations; the position of the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. GRAY.

146. PUBLIC UTILITIES. Economic and legal basis of classification, consideration of relative advantages of public ownership and of public regulation. Central regulation compared with municipal regulation. Basis of rates; relative rates; rates and service. Theories of valuation. GRAY.

161 LABOR PROBLEMS. Modern labor problems: woman and child labor, industrial education, unemployment, poverty, industrial hygiene, welfare work, profit sharing, coöperation, labor unions, strikes, boycotts, conciliation, arbitration; economic causes and effects of immigration. Discussions, investigations of local conditions. CROSGRAVE.

191. PUBLIC FINANCE. Public expenditures; public debt; budgetary legislation; tax systems. BLAKEY.

192. STATE AND LOCAL TAXATION. Problems of state and local taxation. Historic survey of various taxes and examination of present procedure in taxing different kinds of property; tax reforms. Particular attention given to conditions in Minnesota. BLAKEY.

## ECONOMIC ZOOLOGY

### COLLEGE OF AGRICULTURE

Professor FREDERICK L. WASHBURN; Associate Professor ARTHUR G. RUGGLES.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 5. | Forest Entomology | 3 | Jr. | An. Biol. 3-4 |
| *6. | Forest Entomology | 1 | Jr. | 5 |
| 12. | Forest Zoology | 2 | Jr. | An. Biol. 3-4 |

* Given at Itasca Park in summer session.
For additional courses see the bulletin of the College of Agriculture.

INTRODUCTORY COURSES

5. FOREST ENTOMOLOGY. A special study is made of insects affecting shade and forest trees, and the best means of controlling them. RUGGLES.

6. FOREST ENTOMOLOGY. Each student is assigned a particular forest insect or a group of insects to study in the field. Lectures and field excursions are given at Itasca Park. RUGGLES.

12. FOREST ZOOLOGY. A study of forest animals. Relations of game and other birds, and of various four-footed animals to forest protection; habits, range, usefulness, or the contrary; fur-farming; also a discussion of fish culture. WASHBURN.

## GEOLOGY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor WILLIAM H. EMMONS; Assistant Professor CHESSLEY J. POSEY.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 2. | Geology | 3 | Soph., jr. | None |
| 33. | Physiography | 3 | Soph., jr., sr. | 1 or 2 or 29 |

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

INTRODUCTORY COURSES

2. GEOLOGY. An elementary course giving a brief survey of the field of geology. Topographic map and field work. Given in Colleges of Forestry and Agriculture only. POSEY.

33. PHYSIOGRAPHY. Origin and significance of the earth's features, and the agencies affecting them; detailed study of the physiographic provinces of the United States; topographic map and field work. Given in College of Forestry only. POSEY.

## GERMAN

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor CARL SCHLENKER; Assistant Professor WALTER R. MYERS; Instructors JAMES DAVIES, J. THEODORE GEISSENDOERFER, ARTHUR R. GRAVES, ALFRED E. KOENIG, THEOPHILUS H. SCHROEDEL, HAROLD W. SOULE.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Beginning | 6 | All | None |
| 3a,b. | Intermediate | 6 | All | 1a,b. |
| 21-22. | Scientific Intermediate | 6 | All | 2 or 2 yrs. prep. German |

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

INTRODUCTORY COURSES

1a,b. BEGINNING. Double course, given each semester as a 6 hour course. Pronunciation, grammar, conversation, and composition; selected

reading in easy prose and verse. MYERS, DAVIES, GRAVES, KOENIG, SCHROEDEL, SOULE, SHUTTER.

3a,b. INTERMEDIATE. Double course given each semester as 6 hour course. Selected texts in modern narrative and descriptive prose; selected lyrics and ballads; a drama of Lessing, Goethe, or Schiller. Assigned readings of texts outside of class. MYERS, DAVIES, GRAVES, KOENIG, SCHROEDEL, SOULE, SHUTTER.

21-22. SCIENTIFIC INTERMEDIATE. This course aims to give students a reading knowledge of German for use in scientific studies. It may be supplemented by course 27-28. Not open to those who have obtained credit for course 17-18 or course 5-6. GEISSENDOERFER.

## GYMNASIUM

Instructor D. C. MITCHELL.

A gymnasium fee of $1.50 will be charged each semester.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | Gymnasium | 0 | All | None |
| 2. | Gymnasium | 0 | All | 1 |

### INTRODUCTORY COURSES

1. GYMNASIUM. Calisthenics, light apparatus, and corrective work. Swimming and diving.

2. GYMNASIUM. Continuation of course 1, adding games of hand ball, indoor baseball, basketball, and volley ball. Students must be able to swim the length of the pool.

## HORTICULTURE

### COLLEGE OF AGRICULTURE

Associate Professor LE ROY CADY.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 56. | Plant Propagation | 1 | Soph., jr., sr. | None |
| 71. | Landscape Gardening | 3 | Jr., sr. | None |

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

### INTRODUCTORY COURSES

56. PLANT PROPAGATION. Methods of propagation of plants by seeds, cuttings, layers, grafting, and budding are studied. The principles of greenhouse management, transplanting, watering, and ventilation are taught. Lectures, reference reading, field, and laboratory work. CADY.

71. LANDSCAPE GARDENING. A general course in the practice and principles of landscape gardening as applied to the home and community. Lectures and field trips to parks and private grounds are given. CADY.

## MILITARY SCIENCE AND TACTICS

Professor and Commandant BERNARD LENTZ; Assistant Commandant and Brigade Adjutant WALTER F. RHINOW; Band Instructor BERT ROSE.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1-2. | Military Drill | None | Fr. | None |
| 3-4. | Military Drill | None | Soph. | 1 yr. Drill |
| 5-6. | Miliatry Drill | 3† | Jr., sr. | 2 yrs. Drill |
| 8. | Military Science | 2* | Jr., sr. | 2 yrs. Drill |

* If taken in connection with Course 5-6.

† No student may receive more than a total of six credits for elective work in both Physical Education and Military Drill.

### INTRODUCTORY COURSES

1-6. MILITARY DRILL. Two years are required of all men who enroll in the freshman and sophomore classes. Students are cautioned to report for the first drill and inform themselves of the requirements of the department.

1-2. Freshman: Practical instruction in schools of the soldier, company, and battalion; signals, ceremonies; first aid.

3-4. Sophomore: Practical and theoretical instruction in schools of the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

5-6. May be taken voluntarily by others ouside of the freshman and sophomore classes. No credit will be allowed for such drill for less than one year.

8. MILITARY SCIENCE. Instruction in advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

## PLANT PATHOLOGY AND BOTANY

### COLLEGE OF AGRICULTURE

Professor EDWARD M. FREEMAN; Associate Professor ELVIN C. STAKMAN.

*General statement.*—For specialization in this department, see bulletin of College of Agriculture.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| *8. | Dendropathology | 1 | Jr., sr. | 10 |
| 10. | Forest Pathology | 3 | Soph. | Bot. 1 yr. |

* At Itasca Park in summer.

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

INTRODUCTORY COURSES

8. DENDROPATHOLOGY. A field study of diseases of trees given at Itasca Park in summer session. FREEMAN.

10. FOREST PATHOLOGY. Elementary study of plant diseases due to fungi, bacteria, and slime-molds; life histories and preventive methods. Lectures, laboratory, and reference. FREEMAN, STAKMAN.

## POLITICAL SCIENCE

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors WILLIAM A. SCHAPER, CEPHAS D. ALLIN; Instructor WILLIAM ANDERSON; Assistant PERCIVAL W. VIESSELMAN.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | American Government | 3 | Soph., jr., sr. | None |
| 5. | European Municipal Administration | 3 | Soph., jr., sr. | 1 |
| 6. | American Municipal Administration | 3 | Soph., jr., sr. | 1 |
| 7a,b. | State and Local Government | 3 | Soph., jr., sr. | 1 |
| *51. | Elements of Business Law | 3 | Jr., sr. | 1 or Econ. 3 |

* Seniors in forestry taking this course discontinue it at the Christmas vacation and receive two credits.

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

INTRODUCTORY COURSES

1a,b. AMERICAN GOVERNMENT. Organization and actual workings of the national government; nature and origin of the American governmental system. SCHAPER, ALLIN, ANDERSON, VIESSELMAN.

5. EUROPEAN MUNICIPAL ADMINISTRATION. A study of French, German, Austrian, and English cities; the forms of government, parties, and elections; achievements in finance, police, sanitation, with city planning and other public services undertaken. SCHAPER.

6. AMERICAN MUNICIPAL ADMINISTRATION. A study of the organization and chief functions of American cities; their growth, relations to the state, forms of charters, inefficiency and corruption, reform measures; and the administration of finance, police, health, and other activities. SCHAPER.

7a,b. STATE AND LOCAL GOVERNMENT. Typical American state governments, special attention given to Minnesota; relation of the states to the United States and the local units; recent experiments such as initiative and referendum, the recall and primaries; social and economic legislation. ANDERSON, VIESSELMAN.

51. ELEMENTS OF BUSINESS LAW, PART I. The aim is to teach so much of the law as every educated man ought to know for his guidance in every day business affairs. This course deals with law of contracts including sales, bankruptcy, and agency. VIESSELMAN.

## RHETORIC

### COLLEGE OF AGRICULTURE

Assistant Professor ROBERT C. LANSING; Instructors ESTELLE COOK, GEORGE G. GLICK, RUTH MOHL.

*General statement.*—Beginning with the class entering in September, 1915, rhetoric credits will not be granted officially until the close of the first semester of the senior year.

At least one quiz paper will be selected at random each semester from other than rhetoric classes and read by the Committee on Delayed English Credit. In addition any instructor may nominate to the committee and submit papers for any junior or senior who in his opinion requires special consideration.

The Committee on Delayed English Credit may require upper-class students to take, without credit, additional courses in rhetoric in order to validate their freshman and sophomore rhetoric credits.

Until June, 1918, students registered previous to September, 1915, may be required to take a supplementary three credit course in rhetoric in place of three of the elective credits required for the degree.

COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Rhetoric | 3 | Fr. | None |
| 2a,b. | Rhetoric | 3 | Fr. | 1 |
| 11. | Argumentation | 3 | Soph., jr. | 2 |
| 12. | Argumentation | 3 | Soph., jr. | 11 |
| 13a,b. | Advanced Argumentation | 6 | Soph., jr., sr. | 12 |
| 21-22. | Public Speaking | 6 | Soph., jr., sr. | 2 |

### INTRODUCTORY COURSES

1a,b. RHETORIC. Note taking, thesis, writing exposition, sentence structure, analysis of prose models. LANSING, GLICK, MOHL.

2a,b. RHETORIC. Narration, description, diction. LANSING, GLICK, MOHL.

11. ARGUMENTATION. Evidence, methods of reasoning, briefing, debating. LANSING, GLICK, MOHL.

12. ARGUMENTATION. Analysis of persuasive speeches, practice in speak-

ing both from the floor and in formal debate. Composition of persuasive articles. LANSING, GLICK.

13a,b. ADVANCED ARGUMENTATION. A course designed primarily for those intending to participate in intercollegiate and society debates, oratorical contests, and extension courses. GLICK.

21-22. PUBLIC SPEAKING. The study and practice of the fundamental principles of voice production, articulation, gesture, platform deportment, and expression. COOK.

## ROMANCE LANGUAGES

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors EVERETT WARD OLMSTED, COLBERT SEARLES; Assistant Professors JULES T. FRELIN, RUTH S. PHELPS; Professorial Lecturer PEDRO HENRIQUEZ UREÑA; Instructors HARRY E. ATWOOD, FRANCIS B. BARTON, NELSON F. COBURN, WILLIS J. PLUMMER, EDWARD H. SIRICH.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Beginning French | 6 | All | None |
| 2a,b. | Beginning French | 3 | All | Prep. French 1 yr. |
| 3a,b. | Intermediate French | 6 | All | 1 or equiv. |
| 4. | Survey of French Literature | 6 | All | 1 or equiv. |
| 5-6. | Survey of French Literature | 6 | All | 3 or equiv. |
| 7-8. | Elemen. French Conversation | 2 | All | 3 or equiv. |
| 9-10. | Elemen. French Composition | 1 | All | 3 or equiv. |
| 31a,b. | Beginning Spanish | 6 | All | None |
| 33-34. | Beginning Spanish | 6 | All | None |
| 35a,b. | Intermediate Spanish | 6 | All | 31 or equiv. |
| 37-38. | Intermediate Spanish | 6 | All | 31 or equiv. |
| 39-40. | Spanish Literature of the Nineteenth Century | 6 | All | 35 or equiv. |
| 41-42. | Elementary Spanish Conversation. | 2 | All | 35 or equiv. |
| 43-44. | Elementary Spanish Composition. | 2 | All | 35 or equiv. |

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

### INTRODUCTORY COURSES

1a,b. BEGINNING FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar, drill, oral exercises, and translation. SEARLES, FRELIN, ATWOOD, BARTON, COBURN, SIRICH.

2a,b. BEGINNING FRENCH. Semester course. For those who have completed one year of preparatory French. BARTON.

3a,b. INTERMEDIATE FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Review of gram-

mar, composition, conversation, and reading, representative authors of the Nineteenth Century. FRELIN, ATWOOD.

4. SURVEY OF FRENCH LITERATURE. Double course. Same as 5-6. BARTON.

5-6. GENERAL SURVEY OF FRENCH LITERATURE. Lectures, recitations, and assigned readings. Designed to cover the whole period in historical outline, and to prepare for a more minute study of special periods. Selections from representative authors. PHELPS, ATWOOD, SIRICH.

7-8. ELEMENTARY FRENCH CONVERSATION. Small amount of outside preparation will be required. The section meeting at nine o'clock on Monday, Wednesday, and Friday is limited to students taking course 5-6 and is based on the work of that course. FRELIN, BARTON, SIRICH.

9-10. ELEMENTARY FRENCH COMPOSITION. FRELIN, BARTON.

31a,b. BEGINNING SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar drill, oral exercsies, and translation. UREÑA, PLUMMER.

33-34. BEGINNING SPANISH. This course is the same as course 31 except that it is a year-course. OLMSTED, COBURN, PLUMMER.

35a,b. INTERMEDIATE SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and reading. UREÑA, PLUMMER.

37-38. INTERMEDIATE SPANISH. This course is the same as course 35a,b, except that it is a year-course. UREÑA, COBURN.

39-40. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Lectures, recitations, and assigned readings. UREÑA.

41-42. ELEMENTARY SPANISH CONVERSATION. A small amount of outside preparation required. The life and customs of modern Spain; accompanied by illustrative material. PLUMMER.

43-44. ELEMENTARY SPANISH COMPOSITION. Special attention given to social and commercial correspondence. PLUMMER.

## VETERINARY SCIENCE

### COLLEGE OF AGRICULTURE

Professor MYRON H. REYNOLDS; Assistant Professor WILLARD L. BOYD; Instructor CHARLES C. PALMER.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| *16. | Veterinary Medicine ..... | 2 | Jr. | None |

* First two-thirds of semester.

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

INTRODUCTORY COURSES

16. VETERINARY MEDICINE. Brief course covering food and care in relation to disease, elementary pathology, diagnosis, common diseases, common medicines, wounds, unsoundness. REYNOLDS, BOYD, PALMER.